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ABSTRACT

Described is a project to devise four environmental education models targeted to: (1) secondary school teachers teaching separate courses on energy; (2) elementary and secondary teachers seeking to infuse environmental education into social science courses; (3) elementary and intermediate teachers seeking to infuse environmental education into natural science courses; and (4) community leaders seeking to enhance awareness of energy and environmental issues in adult organizations. The report presents a history of the project; a description of the project conceptual basis; a description of the models; a set of operational specifications for the models; a set of specifications for teacher training materials; and appendices of support information. (Author/RE)

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THE ENVIRONMENTAL EDUCATION TEACHER TRAINING MODELS PROJECT

U.S. DEPARTMENT OF HEALTH EDUCATION & WELFARE NATIONAL INSTITUTE OF EDUCATION

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FINAL REPORT

Contract No. 300-77-0158

APRIL 15, 1977-
NOVEMBER 15, 1978

Submitted to the
Office of Environmental Education
United States Office of Education
Washington, D.C. 20202

FAR WEST LABORATORY FOR EDUCATIONAL RESEARCH AND DEVELOPMENT
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SE 029 207

The Environmental Education Teacher Training Models Project

April 15, 1977
to
November 15, 1978

FINAL REPORT

by

Bela H. Banathy
Stephen R. Mills

for

The Office of Environmental Education
United States Office of Education
Washington, D.C. 20202

Contract No. 300-77-0158

November 15, 1978

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FAR WEST LABORATORY FOR EDUCATIONAL RESEARCH AND DEVELOPMENT
1855 Folsom Street • San Francisco, California 94103

INTRODUCTION

Under a contract with the Office of Environmental Education, the Far West Laboratory for Educational Research and Development has developed a set of four environmental education training models targeted to the following groups:

- Secondary school teachers (grades 10-12) who will conduct environmental education as a separate course with emphases on energy allocation, depletion, and conservation.
- Elementary (grades 4-6), intermediate (grades 7-9), and secondary (grades 10-12) level teachers who will infuse environmental education concepts and principles into their existing social (studies) science courses.
- Elementary and intermediate level teachers who will infuse environmental education concepts and principles into their existing natural science courses.
- Community leaders who will conduct environmental/energy awareness and problem-solving activities in adult community organizations.

These models describe the behavior characteristics and the curriculum content required to develop environmentally literate teachers and community personnel and to prepare them for planning, developing, and managing environmental education programs in a variety of settings.

Each of the four models is presented in a separate document and the entire set is accompanied by a sourcebook for curriculum content. The models were designed to orient a variety of users to a systemic environmental education design process, but are primarily applicable for developers of teacher training curricula. Though presented as four separate documents, the components of the models, their structure, and the approach to their design are quite similar.

Project Staff

The project was conducted as part of the Instructional and Training Systems (ITS) Program of the Far West Laboratory (FWL).

The design team consisted of Bela H. Banathy (Principal Investigator to the project), Larry L. Peterson, Stephen R. Mills, and Kathryn O'Connell. Carol

Murphy was a writer/editor for the project. Cathy Aaron contributed to the development of the Sourcebook. In addition to these regular staff, several people, acting as project consultants, contributed to the development of the Sourcebook, including: David Sutton, Gil Friend, Roger Brown, Michael Black, Tony Stigliano, Polly Pharr, and Vicki Tiernan. Laird Blackwell, project evaluator, assisted in developing the evaluation plan for the models.

In this report, we present:

- a brief history of the project (Chapter One);
- a description of the conceptual basis for the project (Chapter Two);
- a description of the models and sourcebook (Chapter Three);
- a set of operational specifications for the environmental education training models (Chapter Four);
- a set of product specifications for EE teacher training materials (Chapter Five);
- support information introduced in the body of the report (Appendices).

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CHAPTER ONE:

BRIEF HISTORY OF THE PROJECT

The Kellogg Foundation at the California State Polytechnic University, Pomona, California, received a contract from the Office of Environmental Education in July, 1975 to develop four teacher training models. The models were to represent a teacher training program in four areas: Environmental Education at the Secondary Level Model, Infusing Environmental Education into Science, Infusing Environmental Education into Social Studies, and Adult Community Education.

In July, 1976 a decision was made by O.E.E. that the models should be developed based on the design specifications proposed by the Far West Laboratory in May and June, 1976 under a subcontract arrangement.* Subsequently, a contract was made between the Kellogg Foundation at the California State Polytechnic University and Far West Laboratory for the elaboration of the design specifications and the development of the four models.

During September through December, 1976, time was spent reviewing materials developed by the project staff at California Polytechnic University and a discrepancy analysis was made to determine the work required to bring the materials up to the new design specifications.

While the discrepancy analysis went on we began to develop a prototype model for the secondary (high school) target group based on the specifications of the original RFP. That model was reviewed and approved by a site review team of O.E.E. in January, 1977. Based on the high school prototype, parallel development proceeded on the other three models.

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*The subcontract was received from the Kellogg Foundation in May, 1976. A substantative statement on the design specifications is reported in Appendix A.

In April, 1977, O.E.E. renegotiated the contract directly with the Far West Laboratory, which became the prime contractor. This renegotiated contract modified somewhat the original scope of work: (1) the Adult Community Education Model was narrowed to address more specifically adult community leadership as a target group; (2) the Secondary School Model was geared more specifically to energy-focused environmental education; and (3) the Natural and Social Sciences Models were to include only the Behavioral and Curriculum Models and Content Specifications.* In addition, two new tasks were added: (1) to develop operational specifications for materials development; and (2) training product specifications for the Secondary School Model.

In November, 1977, the models were favorably reviewed by an external (non-Laboratory) panel and a report on the review was sent to the Office of Environmental Education.** The four models were printed and copies submitted to O.E.E. by the end of 1977.

During the fall of 1977, work continued to progress on the development of a Sourcebook.*** This work was influenced by the development of teacher training modules materials (four modules), based on the High School Model, initiated December, 1977, and supported by a Grant from the O.E.E. This materials development work indicated the need for a more comprehensive and in-depth approach to the Sourcebook.

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* See Chapter Three for a complete description of the design components for each model.

** See Appendix B.

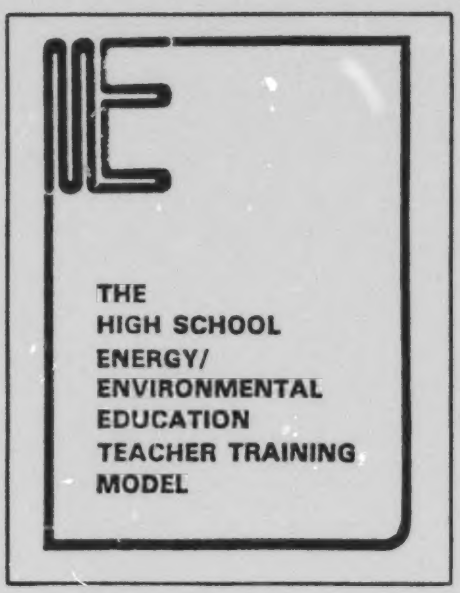
*** The Sourcebook displays information on curriculum content compatible with the content specifications of the model.

Accordingly, the contract was modified again to produce a significantly expanded Sourcebook to include:

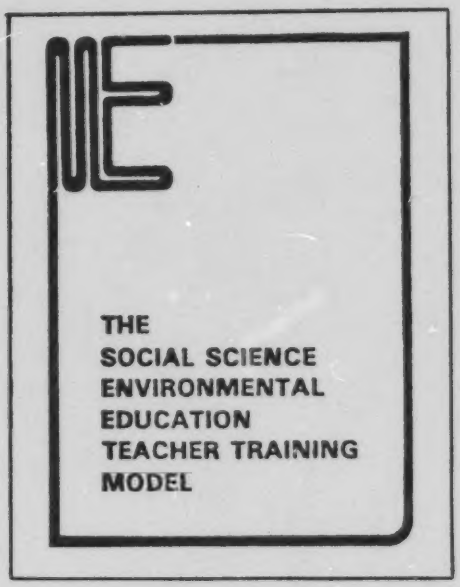
- an elaboration of the content components of the Environmental Education Teacher Training Model,
- a user plan describing strategies appropriate to the intended target group,
- an annotated bibliography of relevant sources, and
- a glossary of terms, concepts, and principles.

With completion of the Sourcebook by mid-November, 1978, Contract # 300-77-0158 was terminated. Copies of the four models and the Sourcebook were submitted to the Office of Environmental Education.

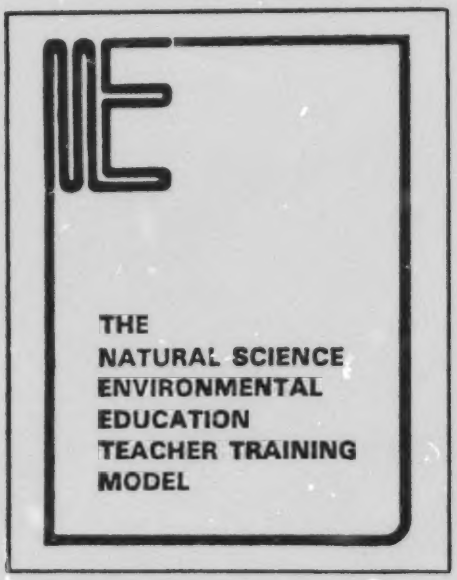
Copies of the cover pages of these five documents appear on the following two pages.



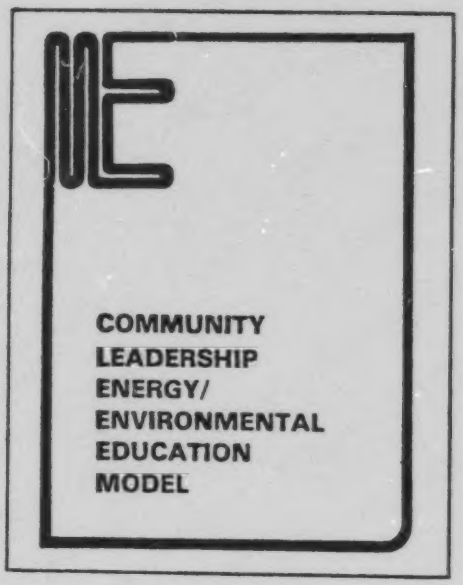
This document portrays a model of a teacher training program directed toward secondary school teachers (grades 10-12) who will conduct environmental education with emphasis on energy allocation, depletion, and conservation.



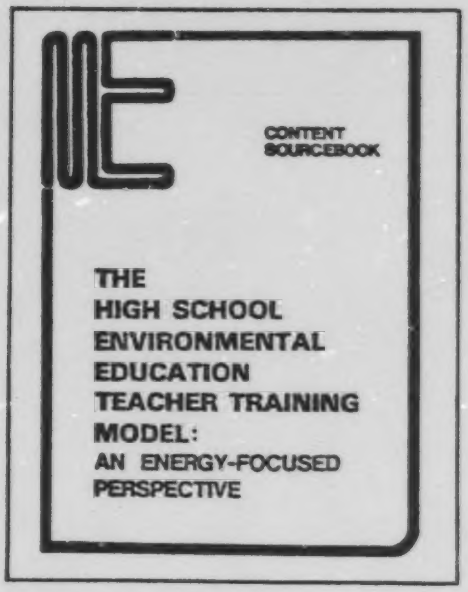
This document portrays a model of a teacher training program directed toward dlementary (grades 4-6), intermediate (grades 7-9), and secondary level (grades 10-12) teachers who will infuse environmental education into their existing social science (studies) courses.



This document portrays a model of a teacher training program directed toward elementary (grades K-6) and intermediate level teachers (grades 7-9) who will infuse environmental education into their existing natural science courses.



This document portrays a model of a teacher training program directed toward community leaders who will conduct environmental/energy education in adult community organizations.



This document provides an extensive knowledge and resource base for developing environmental education instructional/learning materials. It includes elaborated descriptions of the content components presented in the high school model, an annotated bibliography and a glossary.

CHAPTER TWO:

CONCEPTUAL BASIS FOR THE PROJECT

A systems viewpoint constituted the basis for the conceptualization of the EETT models. Emerging from this viewpoint was a set of organizing perspectives that guided the design of the models. This set included:

- a holistic, transdisciplinary, and issue-focused view of environmental education curricula;
- a problem-solving and decision-making emphasis;
- a holistic approach to the design of the models;
- giving primacy to the learning-experience level (in the hierarchical complex of education); and
- considering teaching as a decision-making process.

First the core concept of holism will be explained, followed by a characterization of the organizing perspectives.

Holism: A Synthetic Mode of Thinking

In a world of ever-increasing complexity and interdependence, we are experiencing a transformation from an age of reductionism to an age of holism. Reductionism seeks to: (1) break down entities into their constituent parts, and (2) characterize and understand the "whole" from the explanation of the behavior and characteristics of its parts. The holistic viewpoint, on the other hand, maintains that: (1) understanding the "whole" requires more than a mere examination of its parts, and, conversely, (2) any part can be understood only in the context of its associations and interactions with all other parts. Thus, holism requires a synthetic mode of thinking, as reductionism requires an analytic mode. In holistic thinking, something to be examined is viewed as a component part of a larger system and is explained in terms of its role in and interrelationships with the larger system.

A Holistic and Transdisciplinary Approach to Environmental Education Curriculum

A holistic and transdisciplinary approach to EE curriculum development leads us to integrate the findings of various disciplines, as we deal with issues of ever-increasing complexity, such as urbanization, energy and land use, the application of technology, economic priorities and governance, and a host of social and environmental problems. These issues and problems are reflected in the interaction of the systems of humans and nature, an interaction central to an understanding of environment-related problems. Environmental education, therefore, should aim at developing competence in the examination and articulation of the patterns of the whole and the interaction of parts which integrate into the whole. Such education will enable the individual to confront environmental issues from a perspective of wholeness (rather than from the confines of a single discipline), and to see the relationships between the various components of the systems of humanity and nature to which the problem is related.

A Problem-Focused and Decision-Making Orientation

Real environmental problems and issues are usually broad in scope, often having regional, national, or global significance. In order to address these problems and issues adequately, therefore, environmental education should engage users in values clarification, problem-solving, planning, and decision-making processes that prepare them for dealing with environmental problems affecting both their individual lifestyles and the needs and goals of society.

A Holistic View in the Design of the Model

As used here, the term "model" refers to an abstraction or a blueprint for something to be developed. A teacher-training model is, therefore, an abstraction or blueprint for a teacher-training program that can be developed based on the parameters and guidelines explicit (or implicit) in the model.

Thus, the outcome of the project reported on here was not a model program, but a model for environmental education teacher training.

In order to design a model based upon our understanding of the principles of operation and interaction within and between human and natural systems, it is necessary that the model be open-ended and readily revisable. This is because our understanding of these systems is incomplete and always changing. The model, therefore, should be an adaptable one, built on the collective experiences of its designers, and subject to "corrections" based on the application experiences of others.

The model must also display a spectrum of values and must address their implications, consequences, and impacts in various energy and environmental contexts. This is the affective aspect of the model.

The model must also specify human capabilities required to engage effectively in decision-making and problem-solving. This property of the model relates to the human skills aspect.

Finally, our holistic view of design required that the model incorporate and represent all the necessary and sufficient elements of a curriculum system. These elements will be described later.

The Learning-Experience Level is the Primary Level

Education can be thought of as being organized at four levels: institutional, administrative, instructional, and learning-experience. Holistic systems thinking leads us to reaffirm that inasmuch as the learner is (or should be) the key entity of education, the learning-experience level should be the primary level in the system hierarchy of education.

Accordingly, the model has to reflect the notion that learning arrangements are designed around the learner (in this case the teacher, who is now the learner) in order to faciliatate mastery of learning tasks.

Teaching as a Decision-Making Process

The organizing perspective of teaching as a decision-making process assigns the selection and development of instructional/learning arrangements as one of the most important functions of teaching. Within this process, the teacher considers and evaluates outcomes of alternative instructional/learning arrangements and selects those most likely to accomplish specific learning objectives. Based on an assessment of student needs and interests, the teacher, therefore, is actively involved in making decisions regarding planning, implementing, and evaluating EE curriculum and instruction.

CHAPTER THREE:

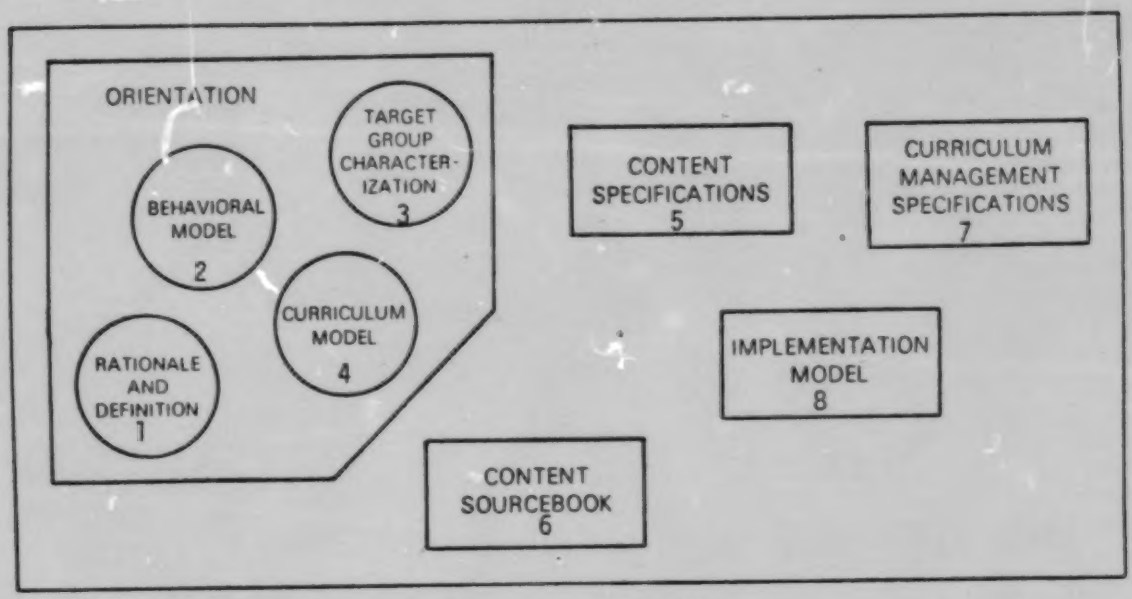
DESCRIPTION OF THE MODELS AND SOURCEBOOK

There are four Environmental Education Training Models, each targeted to a different group of educators: high school teachers, natural science teachers (grades K-9), social science teachers (grades 4-12), and community leaders (in environmental education). The models attempt to address comprehensively the purposes and goals of holistic, transdisciplinary environmental education by presenting components which represent specifications for the development of four training programs.

These components, displayed in Figure 1, are described on the following page.

Figure 1

Generic Components of the Environmental Education Teacher/Community Leader Training Models



1. The *Rationale for and Definition of Environmental Education* presents an exposition of the Environmental Education Act as well as a definition of environmental education.

2. The *Behavioral Model* characterizes the general knowledge, skill, and attitude requirements that define the literate and competent environmental education teacher. It is derived from the Rationale.

3. The *Target Group Characterization* defines the target groups and provides a means to assess their current level of competence in order to ensure the model's compatibility with their needs.

4. The *Curriculum Model* provides an organized description of the various curriculum content domains within which potential teachers need to attain competence. It is consistent with the Rationale and represents an elaboration of the Behavioral Model and the Target Group Characterization.

5. The *Content Specifications* present the knowledge components for environmental education and a description of their instructional foci and purposes. These specifications were designed to satisfy requirements of the knowledge component of the Curriculum Model.

6. The *Content Sourcebook* presents an elaborated discussion of the knowledge components of the content model, a subject matter/cultural process matrix, an annotated resource bibliography, and a glossary. The requirements for the Sourcebook are defined by the Curriculum Model and Content Specifications.

7. The *Curriculum Management Specifications* provides general instructional arrangements that teachers can use to purpose, implement, and evaluate environmental education curriculum. This component was derived from and further elaborates the skills component of the Curriculum Model and Content Specifications.

8. The *Implementation Model* presents the conceptual bases and functions of the implementation process together with characteristic activities associated with each phase of the process. The implementation design was guided by the Curriculum Model.

The generic components that comprise the four models were designed to respond to five basic user-oriented questions. These are:

User-Oriented Question	Relevant Model Components
• What general knowledge, skills, and attitudes am I to require?	*Behavioral and Curriculum Models*
• What do I need to know?	*Content Specifications*
• What materials/resources do I need?	*Content Sourcebook*
• What instructional/learning arrangements are needed?	*Curriculum Management Specifications*
• What physical and logistical arrangements are needed?	*Implementation Model*

The Curriculum Model

The Curriculum Model describes the various competence domains, consistent with the behavioral model, in which potential energy/environmental education teachers and community leaders need to attain competence. The concepts displayed in this model are those deemed necessary for teachers and community personnel to:

- acquire a holistic, systemic awareness and understanding of the environment and related energy issues and problems;
- provide instructional or learning arrangements that transmit this awareness and understanding to others (students, adults), and develop in them a worldview and decision-making capability consistent with environmental and energy awareness.

To accomplish these ends, three competence domains were identified:

- mastery of holistic energy/environmental content;
- competence in managing instructional learning arrangements;
- personal commitment to developing energy/environmental awareness in others.

The Content Specifications

The Content Specifications represents a curriculum model that emphasizes both the societal and individual dimensions of decision-making and their interrelationships; it identifies how these decisions can be made and interpreted from various worldviews. The use and conservation of energy and environmental resources is approached from both the production and consumption points of view, as it relates to the individual and to society.

Figure 2 specifies the components of the Content Specifications and their linkages. These represent an ordered flow of concepts that build the complex configuration for comprehensive environmental education required for informed decision-making.

1. ENERGY/ENVIRONMENTAL-RELATED DECISIONS--this area focuses on the learner as a person with decision-making responsibilities in two major areas affecting resource consumption: career choice and lifestyle.

2. PROBLEM-SOLVING AND DECISION-MAKING--this area explores some major problem-solving routines and presents a model for complex decision-making.

3. ANALYTICAL TOOLS FOR UNDERSTANDING ENERGY/ENVIRONMENTAL SYSTEMS--this area presents certain analytical tools, concepts, and principles that are helpful in understanding and describing environmental systems and systems behavior.

4. ENERGY/RESOURCE DELIVERY SYSTEMS--this area explores the means by which society's demands for energy and resources are satisfied. It examines all stages of resource delivery (from exploration to end use), the environmental "costs" at each stage, and the implications on delivery of our individual and aggregate lifestyle decisions.

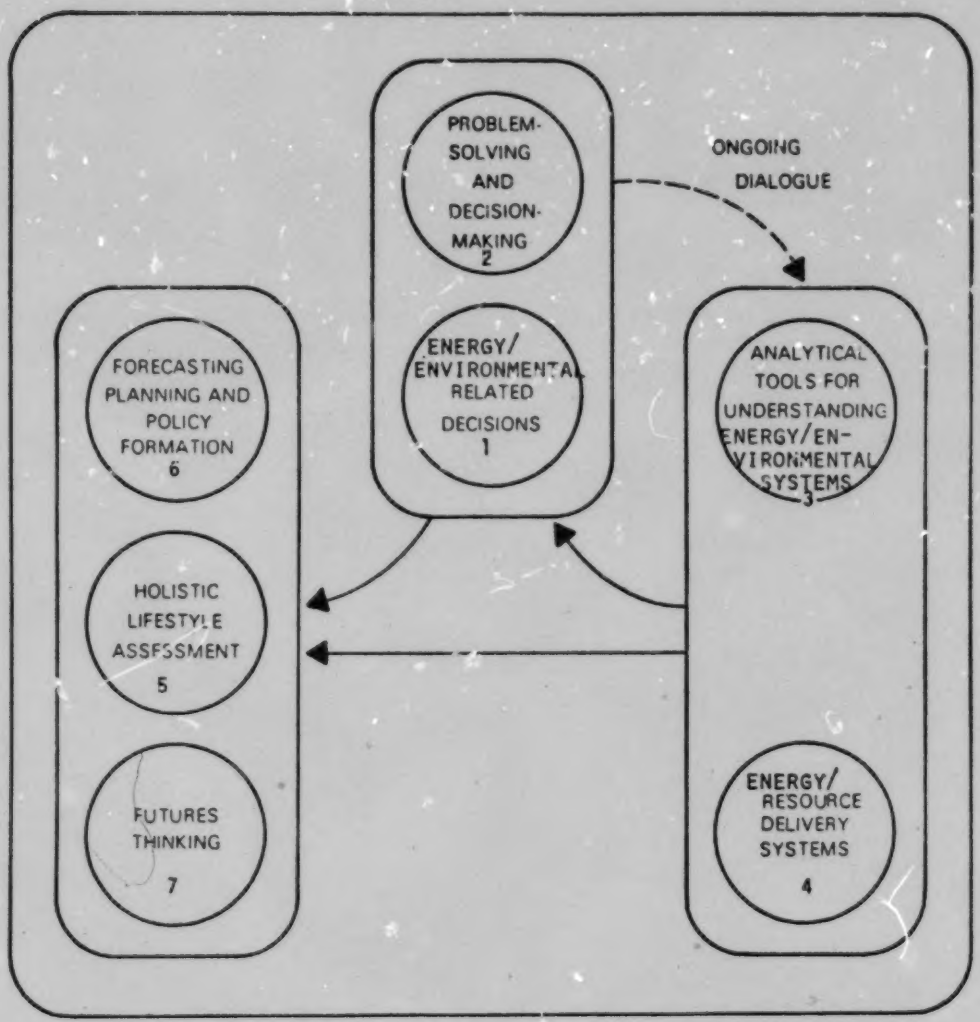
5. HOLISTIC LIFESTYLE ASSESSMENT--this area describes the resource requirements for satisfying basic human needs and for supporting existing lifestyles. It considers the energy relatedness of all actions and events broadly classified according to the individual's (or society's) production and consumption activities.

6. FORECASTING, PLANNING, AND POLICY FORMATION--this area describes the idea of growth management in business, government, and public utilities. It examines forecasts and trends that are important in environmental planning and policy information.

7. FUTURES THINKING--this area addresses the question of future desires and the ability of present environmental resources and resource delivery systems to satisfy these desires. It examines the role that values and lifestyles play in shaping our future thinking regarding the use of resources (human, material, currency).

Figure 2

Content Model for Energy/Environmental Education


PROBLEM-SOLVING AND DECISION-MAKING 2
ONGOING DIALOGUE
ENERGY/ ENVIRONMENTAL RELATED DECISIONS 1
FORECASTING PLANNING AND POLICY FORMATION 6
HOLISTIC LIFESTYLE ASSESSMENT 5
FUTURES THINKING 7
ANALYTICAL TOOLS FOR UNDERSTANDING ENERGY/ENVIRONMENTAL SYSTEMS 3
ENERGY/ RESOURCE DELIVERY SYSTEMS 4

The Curriculum Management Specifications*

The Curriculum Management component introduces specifications for teachers to purpose, plan, implement, and evaluate EE curricula. The specifications delineated herein become the basis for identifying or developing instructional resources (techniques, strategies) which teachers can use to assist students in acquiring desired knowledge, skills, and attitude competencies consistent with the energy/environmental Curriculum Model.

As a general instructional management model, these specifications describe the arrangements by which teachers can:

- select, develop, and implement an energy-focused environmental education curriculum geared to their students' needs and abilities;
- evaluate and adjust specific learning objectives, curriculum content, or instructional strategies as needed to enable students to achieve a desired level of energy/environmental awareness.

The Implementation Model

The Implementation Model presents a systemic overview of the (generic) curriculum implementation process. It describes the conceptual bases (organizing concepts) and components (instructional learning system, learning facilitation system, application systems, and institutional management system) of implementation. It provides a structure/process view of the implementation processes by describing characteristic activities associated with purposing, planning, implementing, and evaluating the above components.

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* As specified in the amended contract, these specifications are presented only for the high school energy focused environmental education teacher training model.

The Content Sourcebook*

The Content Sourcebook presents an elaborated discussion of the knowledge components of the Content Specifications and is intended to provide a more detailed level of understanding of the resources needed to develop a holistic, transdisciplinary environmental education curriculum.

The Sourcebook elaborates on the components of the Content Specifications as follows:

- SYSTEMS APPROACH**--introduces the systems perspective and the language of systems thinking; describes general systems themes and a method for systems diagramming; and provides an example application for approaching an environmental problem using systems themes and diagramming.
- PROBLEM-SOLVING AND DECISION-MAKING--introduces a rational decision-making model from an historical analysis, and the problem-solving/decision-making process in the context of EE; describes major environmental issues for decision-making and relates these to EE (content) entities mandated by the EE Act of 1970; and presents a problem-solving/decision-making model.
- ENERGY/ENVIRONMENTAL CAREER RELATED DECISIONS--characterizes the energy/environmental career field; describes E/E career-related issues; and presents an integrative framework for E/E career decision-making.
- HOLISTIC LIFESTYLE ASSESSMENT--introduces the notions, concepts, and implications of whole system health, the human system, and holistic lifestyle assessment; describes mechanisms to implement or incorporate the notions of holistic lifestyle assessment; and discusses some of the limits of HLA.
- IDEAL ENVIRONMENTAL WORLDVIEWS***--introduces the notion of worldview and describes the historical development of the concept; and describes a stewardship worldview that is consistent with the long-term survival of humankind and the environment.

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* This material is presented in a document separate from each of the four models due to the quantity of the material contained therein.

** The title used in each of the four EE models is ANALYTICAL TOOLS FOR UNDERSTANDING ENERGY/ENVIRONMENTAL SYSTEMS.

*** This is a new component which compliments E/E CAREER RELATED DECISIONS, HOLISTIC LIFESTYLE ASSESSMENT, and FUTURES THINKING components.

- FUNDAMENTAL CONCEPTS OF ENERGY*--introduces the concepts of thermodynamics, a system of energetics, the maximum power principle, and net energy analysis; and presents bibliographical essays on net energy analysis and energy quality.

- ENERGY RESOURCE DELIVERY SYSTEMS--describes the stages of energy delivery; and describes types of energy resources that are inputs to the energy delivery system.

- FORECASTING, PLANNING, AND POLICY FORMATION--introduces the notion of forecasting and presents a brief history; describes methods and social indications used in forecasting; gives examples of applied forecasting methodology; and characterizes the future of forecasting and future studies.

- FUTURES THINKING--introduces the notion of futures thinking; describes the work of futurists; and presents concerns and images of the future.

In addition to elaborating these components, the Sourcebook provides a good deal of support or related material, including:

- THE USER STRATEGY--describes relationships between the components of the EE training models and their intended users; describes the elements of the EE curriculum domain and a protocol for linking them.

- ENVIRONMENTAL EDUCATION ENTITIES--describes 12 key (content) entities interpreted from the EE Act of 1970 and other Office of Environmental Education documents. These entities provide an important basis for developing EE curricula and programs.

- ISSUES OF NATIONAL PRIORITY--presents narrative descriptions of ten major energy or environmental issues that can provide the basis for the development of EE curricula.

- SUBJECT MATTER/CULTURAL PROCESS MATRIX--provides a matrix for structuring EE curricula content in terms of (a) EE principles and concepts; (b) instructional learning resources; and (c) competences (for the environmentally aware and literate citizen) for <u>each</u> of the various topic areas.

- A BIBLIOGRAPHY for each component of the content specifications, and a GLOSSARY are provided.

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* This component was presented separately in the High School and Community Leadership energy-focused models, but was subsumed under the ANALYTICAL TOOLS...component of the Natural Sciences and Social Science Models.

The Sourcebook is intended to accompany the four Models. The entire set (five documents) was designed to orient a variety of users to a systemic environmental education design process, but are primarily applicable for developers of teacher training curricula.

The Environmental Education Training Models address comprehensively the purpose and goals of holistic environmental education, and transform these at the individual model level into components that represent specifications for the development of our training programs.

CHAPTER FOUR:

OPERATIONAL SPECIFICATIONS FOR THE ENVIRONMENTAL EDUCATION TRAINING MODELS

The Operational Specifications address the general utility of the Environmental Education Teacher Training Models (EETTM's) from the point of view of identifying intended users of the model, describing the curriculum domain of energy-focused environmental education, and enumerating a set of protocol statements as a guide for the programmatic use of the curriculum domain by developers of instructional materials.

The Operational Specifications contain:

- A matrix and discussion of the relationships between the components of the EETTM's and their intended users;
- A description and definition of the elements of the curriculum domain of energy environmental education;
- A set of protocol statements describing essential relationships among the elements of the EE curriculum domain;
- A description of the Contextual Map as a framework for developing comprehensive and holistic EE curricula and supporting instruction materials.

Relationships Between EETTM Components and Intended Users

THE EETTM COMPONENTS

The components comprising the Environmental Education Teacher Training Models are described below.

Orientation	Introduces a systemic approach to the instructional and content domains of holistic energy/environmental education. Contains: Rationale and General Definition of Environmental Education, Behavioral Model, Target Group Characterization, and Curriculum Model.
Content Specifications	Describes the components of the environmental education content model (e.g., Energy Delivery Systems, Futures Thinking).
Content Sourcebook	Provides an extensive resource base for developing instructional/learning materials: includes elaborated description of the content components, an annotated bibliography, and a glossary.
Curriculum Management Specifications	Describes a general instructional management sequence to purpose, plan, implement and evaluate an energy/environmental education curriculum.
Implementation Model	Describes characteristic activities needed to effect a comprehensive, effective EE teacher training program in a variety of settings.

Figure 3 provides a summary image of the above components.

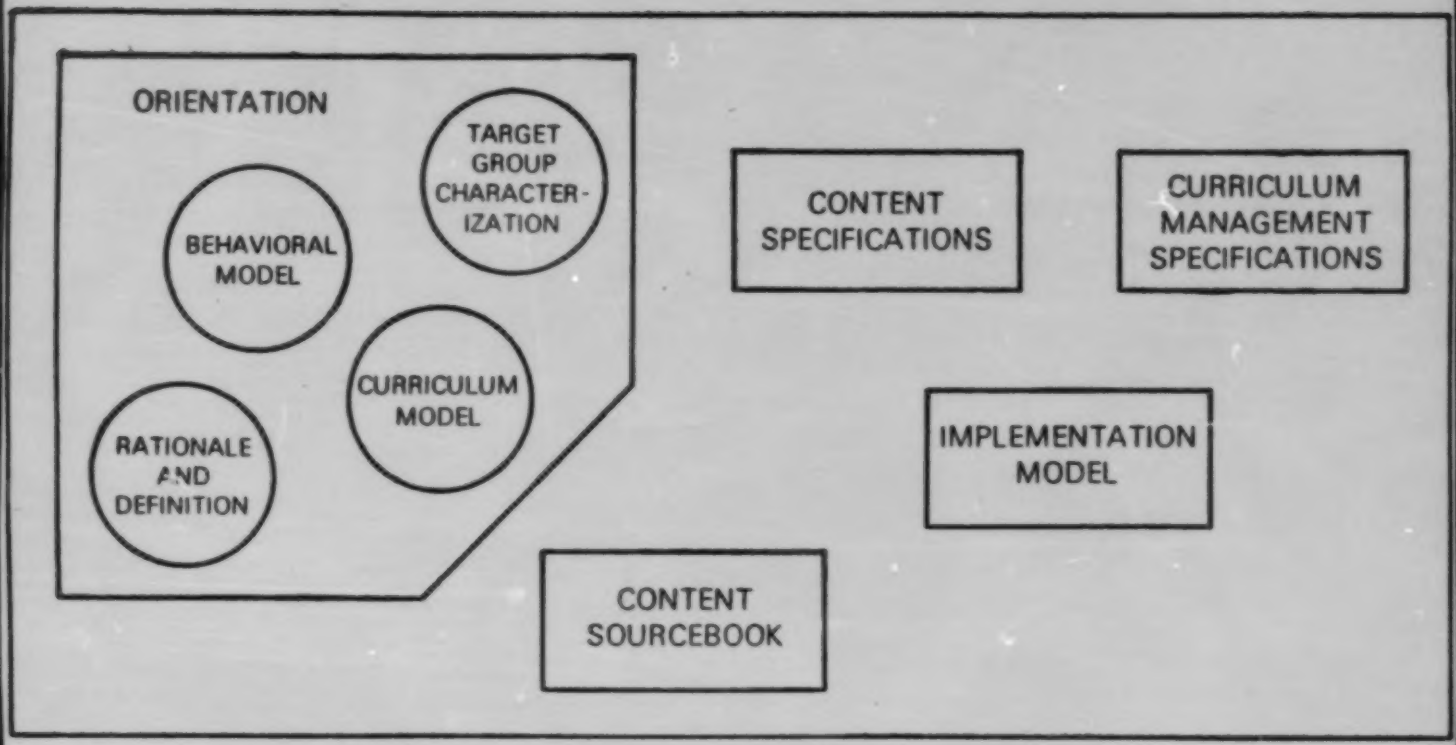


Figure 3

Energy/Environmental Education
Teacher Training Model

INTENDED USERS

The documents described on the previous page comprise the components of the Environmental Education Teacher Training Models. They may be used in a variety of ways, depending on the focus and goal of the intended user. The relationships between EETTM documents and their intended users are presented on the following pages and summarized in Table 1.

1. EDUCATIONAL RESEARCH AND DEVELOPMENT ORGANIZATIONS

Example:	Application:
Far West Laboratory for Educational Research and Development, Educational Development Center, American Institutes for Research, SRI (Stanford Research Institute).	• Use all documents to produce EE training products at the modular, component, or program level.

2. INTERNATIONAL EE ORGANIZATIONS

Example:	Application:
World Education, International Union for the Conservation of Nature and Natural Resources.	Use all documents to assist in: • developing new training products • developing criteria for evaluating existing programs • developing guidelines for future funding efforts

3. PROFESSIONAL EDUCATION ASSOCIATIONS

Example	Application
National Science Teachers Association, National Council for the Social Studies, Conservation Education Association.	• Use behavioral, curriculum, and content models as basis for assessing current knowledge, skill, and attitudinal competencies of teachers, and for recommending changes in teacher preparation programs. • Use all documents to develop criteria/guidelines for recommending future research and development efforts. • Use Content Specifications and Content Sourcebook to develop series of introductory articles in professional magazines on "what constitutes holistic energy/environmental education," etc.

4. ENERGY/ENVIRONMENTALLY CONCERNED FEDERAL, STATE AND LOCAL GOVERNMENT AGENCIES

Example	Application
Energy Research and Development Administration, California Conservation Corps, Natural Resource Department.	• Use Content Specifications and Content Sourcebook to generate criteria and guidelines for policy/decision-making regarding program and personnel development.

5. STATE ENVIRONMENTAL DIRECTORS AND TRAINING PERSONNEL

Example	Application
Department of Public Instruction.	• Use all documents to develop criteria for assessing existing stage plans and making recommendations for future changes. • Use Content Specifications and Content Sourcebook (descriptions and annotated bibliography) as basis for presentations, structuring conferences, and making recommendations to the legislature regarding curricula changes.

6. UNIVERSITIES

Example	Application
Teacher Education Departments, Environmental Studies Institutes.	• Use behavioral and curriculum model to assess their array of competencies. • Use all documents to develop course(s) to provide opportunity for secondary teachers to become proficient in planning, developing and implementing energy/environmental education courses. • Use Content Specifications and Content Sourcebook to develop criteria and guidelines for assessing comprehensiveness of existing curricula or establishing an interdisciplinary energy/environmental program at the B.S. or M.S. level.

7. CURRICULUM SPECIALISTS/DEVELOPERS AT SCHOOL DISTRICT LEVEL

Application

- Use behavioral and curriculum model to assess current competence level of teachers.
- Use Content Specifications, Content Sourcebook, and Curriculum Management Specifications to develop criteria to assess current programs and to make recommendations for future training.
- Use Implementation Model to develop effective implementation plan.

8. STATE AND FEDERAL LEGISLATIVE STAFF AND COMMITTEES CONCERNED WITH ENERGY, ENERGY/ENVIRONMENTAL EDUCATION

Application

- Use Content Specifications and Content Sourcebook to develop criteria for reviewing legislation.

9. ENERGY/ENVIRONMENTALLY CONCERNED YOUTH GROUPS

Example	Application
Boy Scouts, Girl Scouts, 4-H.	• Use all documents to develop guidelines for assessing current energy/environmental education projects/programs and for developing new ones.

10. PUBLISHING FIRMS

Example	Application
Harcourt Brace Jovanovich, MIT Press, Scott, Foresman and Co.	• Use Content Specifications, Content Sourcebook, Curriculum Management to develop criteria and guidelines to assess materials submitted and to commission development of new interdisciplinary series.

11. EDUCATIONAL TELEVISION

Example	Application
Instructional Television, Divisions of PBS at national and local level.	• Use Content Specifications and Content Sourcebook to develop guidelines for program development.

12. ENERGY/ENVIRONMENTALLY CONCERNED COMMUNITY GROUPS

Example	Application
Sierra Club, Farallones Institute, Friends of the Earth, League of Women Voters.	• Use all documents to develop guidelines for assessing current energy/environmental education projects/programs and for developing new ones.

INTENDED USERS AND APPLICATIONS	DOCUMENTS ASSESSING MODEL COMPONENTS								
	Content Sourcebook			Orientation			Content Specifications	Curriculum Management	Implementation
	Subject Matter/ Process Matrix	Content Descriptions	Annotated Bibliography	Rationale[1]	Behavior Model	Curriculum Model			
1. Educational Research and Development Organizations									
• Producing training products	*	*	*		*	*	*	*	*
2. International EE Organizations									
• Developing training products • Developing program evaluation criteria • Developing future funding guidelines	*	*	*		*	*	*	*	*
3. Professional Education Associations									
• Assessing teacher competence					*	*	*		
• Recommending future R&D	*	*	*		*	*	*	*	*
• Developing publications	*	*	*				*		
4. Energy/Environmentally concerned Federal, State and Local Governmental Agencies									
• Generating criteria and guidelines for policy and decision-making	*	*	*				*		
5. State Environmental Directors and Training Personnel									
• Assessing state plans	*	*	*		*	*	*	*	*
• Making legislative recommendations	*	*	*				*		
6. Universities									
• Assessing teacher competence					*	*			
• Developing teacher training programs	*	*	*		*	*	*	*	*
• Assessing existing curricula/programs	*	*	*				*		

[1]Rationale in the Orientation Manual is essential for all intended users to address because it orients the reader to the domains of holistic energy/environmental education.

Table 1. POTENTIAL USERS AND APPLICATIONS FOR THE EETTM

INTENDED USERS AND APPLICATIONS	DOCUMENTS ASSESSING MODEL COMPONENTS								
	Content Sourcebook			Orientation			Content Specifications	Curriculum Management	Implementation
	Subject Matter/ Process Matrix	Content Descriptions	Annotated Bibliography	Rationale[1]	Behavior Model	Curriculum Model			
7. Curriculum Specialists/Developers at School District Level									
• Assessing teacher competence	*	*	*		*	*	*	*	
• Developing program assessment criteria									*
• Developing program implementation plans									
8. State and Federal Legislative Staff and Committees									
• Developing legislative review criteria	*	*	*				*		
9. Energy/Environmentally concerned Youth Groups									
• Assessing projects/programs or developing new ones	*	*	*		*	*	*	*	*
10. Publishing Firms									
• Assessing or commissioning publications	*	*	*				*	*	
11. Educational Television									
• Developing guidelines for program development	*	*	*				*		
12. Energy/Environmentally concerned community groups									
• Assessing projects/programs or developing new ones	*	*	*		*	*	*	*	*

[1] Rationale in the Orientation Manual is essential for all intended users to address because it orients the reader to the domains of holistic energy/environmental education.

Table 1 (Continued). POTENTIAL USERS AND APPLICATIONS FOR THE EETTM

Elements of the EE Curriculum Domain

The curriculum domain of energy/environmental education is composed of several components:

- Issues of National Priority
- Key Environmental Entities
- Settings of Environmental Interest
- Context(s) for Environmental Education
- Content Specifications
- EE Curriculum Map

These elements are considered separately in this section and are blended together by the Protocol outlined in the last section.

ISSUES OF NATIONAL PRIORITY

National priority issues are the environmental issues, topics, and concerns of our national, state, and local leaders. These issues have both broad and specific implications for environmental education, which make them very complex and difficult to handle in instructional situations. Resolution of these issues by our society is an ongoing process that involves making and changing policies, regulations, and legislation; and changing our individual lifestyles as we become more environmentally and energetically aware citizens.

Kahn, Brown, and Martel offer a list of candidates for Issues of National Priority.[1] This list is presented on the following pages. Many items have energy/environmental education implications. Areas 2 and 3 address environmental issues exclusively.

1. Intrinsically dangerous technology

   a. Modern means of mass destruction
   *b. Nuclear reactors--fission or fusion
   c. Nuclear explosives, high-speed gas centrifuges, etc.
   d. Research missiles, satellite launchers, commercial aircraft, etc.
   *e. Biological and chemical "progress"
   f. Molecular biology and genetics
   g. "Mind control"
   h. New techniques for insurgency, criminality, terror, or ordinary violence
   i. New techniques for counterinsurgency, or imposition of order
   j. New serendipities and synergisms

---

[1] Herman Kahn; William Brown; Leon Martel, The Next Two Hundred Years ((New Jersey: William Morrow & Co.), 1976.

*Asterisk indicates Issues of National Priority that directly relate to the Key Environmental Entities as specified in the amended EE Act.

*2. Gradual worldwide and/or national contamination or degradation of the environment

a. Radioactive debris from various peaceful nuclear uses
b. Possible greenhouse or other effects from increased CO_2 in the atmosphere, new ice age because of dust in stratosphere, damage to ozone layer, etc.
c. Other special dangerous wastes--methyl mercury, PCB, etc.
d. Waste heat
e. Other less dangerous but environment-degrading wastes, such as debris and garbage
f. Noise, ugliness, and other annoying by-products of many modern activities
g. Excessive urbanization
h. Excessive overcrowding
i. Excessive tourism
j. Insecticides, fertilizers, growth "chemicals," food additives, plastic containers, etc.

**3. Spectacular and/or multinational contamination or degradation of the environment

a. Nuclear war
b. Nuclear testing
c. Bacteriological and checmical war or accident
d. Artificial moons
e. Supersonic transportation (shock values)
f. Weather control
g. Big "geomorphological" projects
h. Million-ton tankers (Torrey Canyon was only 111,825 tons) and million-pound planes
i. Other enterprise or mechanism of "excessive" size

---

*Asterisk indicates Issues of National Priority that directly relate to the Key Environmental Entities as specified in the amended EE Act.

**Asterisks indicate entire area pertains to energy/environmental education.

4. Dangerous internal political issues

   a. Computerized records
   b. Other computerized surveillance
   c. Other advanced techniques for surveillance
   d. Excessively degradable (or unreliably reassuring) centralized capabilities
   e. Improved knowledge of and techniques for agitprop and other means of creating distrubances
   f. Improved knowledge of, and techniques for, preventing disturbances
   g. Complex or critical governmental issues leading to either "technocracy" or "Caesarism"
   h. Nuclear weapons affecting internal politics
   i. Excessively illusioned attitudes
   j. Other dangerous attitudes

5. Upsetting international consequences

   a. Both new and "traditional" demonstration effects
   *b. Technological obsolescence of "unskilled" labor
   c. New synthetics--e.g., coffee, oil, etc.
   d. Forced modernization
   e. Growing guilt feelings by many in wealthy nations--particularly among the alienated or young
   f. Inexpensive and widely available "realistic" communications and physical travel
   g. Accelerated "brain drains"
   h. Cheap food
   i. Cheap education
   *j. Control and exploitation of the oceans, space, moon

6. Dangerous personal choices

   a. Sex determination
   b. Other genetic engineering
   c. Psychedelic and mood-affecting drugs
   d. Electronic stimulation of pleasure centers
   e. Other methods of sensual satisfaction
   f. Excessive permissiveness and indulgence
   g. Dropping out and other alienation
   h. Excessive narcissism or other self-regard
   i. Super-cosmetology
   j. Lengthy hibernation

---

*Asterisk indicates Issues of National Priority that directly relate to the Key Environmental Entities as specified in the amended EE Act.

7. Bizarre issues

   a. Generational changes--e.g., extended longevity
   b. Mechanically dependent humans--e.g., pacemakers
   c. Life and death for an individual--e.g., artificial kidneys, etc.
   d. New forms of humanity--e.g., "live" computers
   e. "Forcible" birth control for "impossible" groups
   f. Other external controls or influence on what should be a personal or even institutionally private choice
   g. Life and death or other control of "outlaw" societies that have not yet committed any traditional crime
   h. The continuation of the nation-state system
   i. Control and limitation of change and innovation
   *j. Radical ecological changes on a planetary scale
   k. Interplanetary contamination

Kahn, Brown, and Martel also address eight "uncertain" issues, of which three are of national level environmental concern:

*1. Effects of U.S. superindustrial economy on environment, society, and culture of the U.S. and the world.

*2. Effects of U.S. posindustrial economy on environment, society, and culture of the U.S. and the world.

3. Parallel developments in other countries.

4. Political, institutional, international-security, and arms-control issues.

*5. Possible damage to earth because of complicated, complex, and subtle ecological and environmental effects.

6. Issues relating to quality of life, attitudes, values, morals, and morale for different nations and groups.

7. Images of the future and the likely problems and opportunities created by these images.

8. Degree and effects of bad luck and bad management.

---

*Asterisk indicates Issues of National Priority that directly relate to the Key Environmental Entities as specified in the amended EE Act.

Willis Harman addresses issues of national priority in terms of four major dilemmas confronting society.[2] These four dilemmas specifically address energy/environmental education concerns. The following descriptions are form The Futurist article; the emphasis is ours.

1. The Growth Dilemma

   The environmental and social costs of continued exponential growth in energy and materials usage, and economic growth in the forms we have known, appear to be unacceptably high. But the costs of stopping that growth also appear to be unacceptably high.

2. The Control Dilemma

   We need to guide technological innovation but we shun centralized control...The powers of technology to change any and all aspects of the physical, social, political, and psychological environment grow even greater. In reaction, the society is beginning to demand "technology assessment," a euphemism for anticipatory control, to reduce future negative social and environmental impacts of new technologies.

3. The Distribution Dilemma

   The industrialized nations find it costly to share the earth's resources with less developed nations, but a failure to do so might prove even more costly. The market system does not of itself include consideration for severe inequities in distribution, just as it does not consider either the welfare of future generations or the present costs to society and the environment.

4. The Work-Roles Dilemma

   Industrial society is increasingly unable to supply an adequate number of meaningful social roles. Population pressure, itself a consequence of the technology-aided prolonging of human lives, alters the timetable, making problems crucial earlier than they might be if the population were smaller.

---

[2] Willis W. Harman, "The Coming Transformation," The Futurist, Part I, (February, 1977), p.6.

According to Harman, the four dilemmas represent tradeoffs that grow steadily more intolerable, or situations that steadily worsen. The first three dilemmas relate closely to the Faustian powers of technology and what might be called a "new scarcity." The new scarcity arises from approaching the finite planetary limits of:

- fossil fuels and strategic minerals;
- natural fresh water;
- food-productive, arable land;
- habitable surface area;
- waste-absorptive capacity of the natural environment;
- resilience of the planet's life-support ecosystems.

These Issues of National Priority represent the reasoning of leading "futures thinkers." On a more practical level, discussions of ten I.N.P.'s are included in the Sourcebook, as an example of discussions teachers and teacher/educators could begin to use in instructional situations.

KEY ENVIRONMENTAL ENTITIES

Key environmental entities are concept/topic areas that are key focal points for environmental education. As indicated in the EE Act as amended, these entities are:

1. Population dynamics
2. Pollution
3. Resource allocation and depletion
4. Conservation
5. Transportation
6. Technology
7. Urban and rural planning
8. Environmental Quality
9. Ecological Balance
10. Natural Resource-Related Careers and Vocations
11. Economic and Technological Development
12. Environmental Ethics
13. Energy*

From a holistic understanding of these key Environmental Entities an initial definition emerges for holistic environmental education:

> to develop in learners (trainers, specialists, teachers, and students) an understanding of: (1) how the Key EE Entities are integrated with specified environmental contexts; and (2) how this integration (among the various entities) changes over time with respect to changing contexts.

---

*Added during 1978 re-authorization proceedings for the EE act.

SETTINGS OF ENVIRONMENTAL INTEREST

Settings of Environmental Interest provide a common background or frame-of-reference within which the patterns or sequential relationships between the Key Environmental Entities can emerge. These settings can be specified in different ways:

1. Macro-settings (large or aggregate level)

   a. According to geographical scale

      (1) local
      (2) state
      (3) regional
      (4) national
      (5) global

   b. According to political jurisdiction

      (1) local city or town
      (2) county
      (3) multi-county
      (4) state
      (5) multi-state
      (6) national
      (7) international

   c. According to ecosystem boundaries. Since ecosystems are open systems, boundaries are established to distinguish the inputs of the system from its internal processes (or throughputs). These boundaries can be defined several different ways:

      (1) Boundaries that contain the internal processes/workings of the system.

      (2) Boundaries that establish the territory from which the system receives its inputs.

      (3) Boundaries that establish the territory to which the system sends its outputs.

2. Micro-settings (small or individual level)

   a. home
   b. neighborhood
   c. school
   d. workplace
   e. recreation area

Associated with these different aspects of settings are inherent time properties, which are important to the dynamic relationship between the settings and the key EE entities. For example, the time scales and rhythms associated with the geographical aspects of a particular setting are probably of a very different duration and/or frequency than are those associated with the political jurisdiction aspects of the setting.

To maintain attention and interest, settings must be of importance to the locale and/or student/learner target group. The difficulty for teachers and teacher educators is in designing instructional arrangements in such a way that the selected "setting" is illuminated against a background of holistic and comprehensive EE, thereby enhancing both levels of educational experience--increased resolution of awareness of the local setting and enhanced understanding of the broad implications of EE.

CONTEXTS FOR ENVIRONMENTAL EDUCATION

Contexts for Environmental Education are formed by combining a Setting of Environmental Interest (such as Appalachia) with a Key Environmental Entity, or cluster of entities (such as urban and rural planning) for the purpose of investigating an Issue of National Priority. As the characteristics of the setting change over time (physically, politically, etc.), or new entities are introduced, the context is changed.

CONTENT SPECIFICATIONS

The Content Specifications of the EETTM describe the components of the energy/environmental education curriculum content models. These components represent a conceptualization of the basic set of indicators and processes for gauging or explaining the changing interaction and integration of all EE entities over time within a given energy/environmental context. The components of the four EETTM content models are listed below.

1. Systems Approach
2. Analytical Tools for Understanding Energy/Environment Systems
3. Problem-Solving and Decision-Making
4. Energy/Environment Related Decisions
5. Holistic Lifestyle Assessment
6. Ideal Environmental Worldviews
7. Fundamental Concepts of Energy
8. Net Energy Analysis
9. Energy Quality
10. Resource Delivery Systems
11. Forecasting for Planning and Policy Formation
12. Futures Thinking

These content components emphasize three major characteristic or aspects of any energy/environmental context:

1. Complexity --any context is a complex system with many parts and processes
2. Integration --all parts within a content system are interrelated and each part affects and is affected by the other parts
3. Dynamic nature--the integration (nature and degree of interrelationship, interaction) of the parts within a content system changes over time

THE CURRICULUM MAP

The Curriculum Map (Figure 4) is a matrix showing the interaction of Energy/Environmental Education SUBJECT MATTER AREAS and the BASIC PROCESSES OF THE CULTURE. The purpose of the Map is to help energy/environmental educators: (1) to identify and select potential EE curriculum content from the perspective of their professional subject matter/processes competence and interests; (2) to be able to associate EE subject matter and cultural processes with appropriate EE principles and concepts, learning materials and other resources, and learning/competence objectives.

The SUBJECT MATTER AREAS displayed in the curriculum map describe topics or topic areas that are compatible with the basic disciplines of both Natural Science and the Social Sciences. These topic areas are as follows:

1. Cultural Development and Natural Resources

    a. Natural Resource Bases
    b. Human Evolution and Adaptation
    c. Evolution of Cultural Form
    d. Cultural Forms and Changing Resource Bases
    e. Cultural Adaptations and Changing Resource Bases

2. Contemporary Social System Requirements

    a. Human Needs (Individual and Social)
    b. Socially Derived Needs

3. Energy Basis of Humanity and Nature

    a. Physical/Chemical Properties
    b. Biological (Bio-) Energetics
    c. Macro-Energy Systems Behavior

4. Energy and Culture

    a. Energy and Social Dynamics
    b. Energy and Technology
    c. Energy Dynamics and Community Form
    d. Energy and Citizenship (Aggregate)
    e. Energy and Citizenship (Individual)

5. Energy and Well-Being

    a. Energy, Technology, and Health
    b. Energy Utilization

The PROCESSES OF THE CULTURE displayed in the curriculum map matrix consist of the basic cognitive and affective processes that are employed by all learners in the investigation and exploration of EE contexts. These are as follows:

1. Problem-solving at the levels of:

   a. art
   b. craft
   c. technology
   d. paradigm

2. Decision-making

   a. scientific
   b. management

3. Envaluation

   a. as an individual
   b. between individual and a group or institution
   c. between or among groups or institutions

The instructional considerations that are addressed by the intersections of SUBJECT MATTER and PROCESSES in the curriculum map involve:

1. Concepts, principles, and themes that can address specific EE contexts

2. General competence objectives that satisfy the learning requirements for holistic energy/environmental awareness. These are written at the level of the environmentally aware and/or energy literate citizen.

Figure 4

The Curriculum Map

		PROCESSES OF THE CULTURE			
		Problem-Solving	Decision-Making		Envaluation
			Scientific	Management	
SUBJECT MATTER AREAS	Cultural Development & Natural Resources				
	Contempo-rary Social Systems Requirements				
	Energy Basis of Humanity and Nature				
	Energy and Culture				
	Energy and Well-Being				

Each SUBJECT MATTER/PROCESS intersection addresses:

- EE principles/concepts
- instructional resources
- learning competences

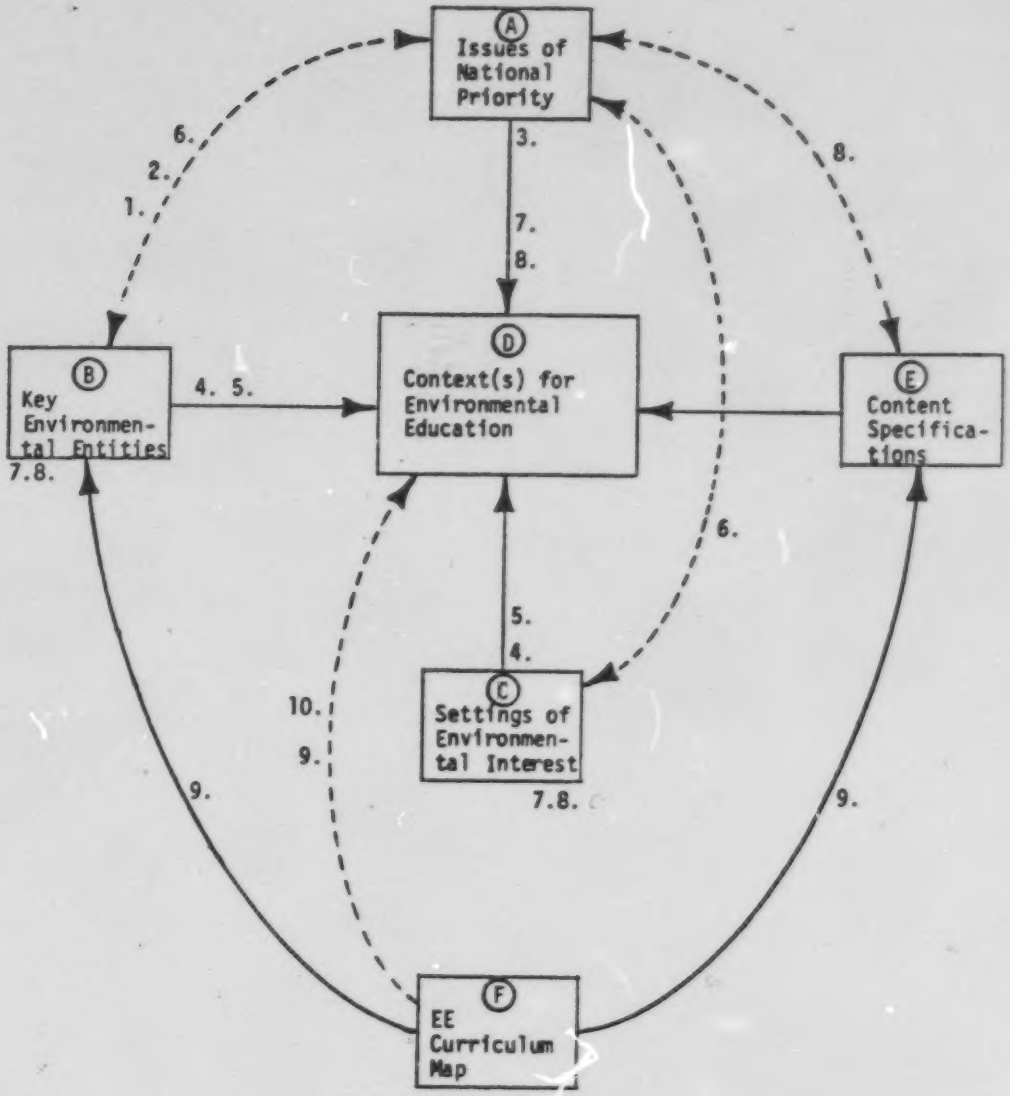
Protocol for Linking the Components of the EE Curriculum Domain

This protocol defines the essential qualities of the relationships among the components of the EE Curriculum Domain described previously, and provides several guidelines for their utilization. The purpose of these components is to facilitate the design of learning experiences and activities that illuminate and explore the topics, concepts, and themes of energy/environmental problems and issues. The protocol is not sequentially perscriptive, but relationally prescriptive--i.e., the purpose is to guide the sequence of developing learning activities so that a holistic and comprehensive overall learning experience is arranged.

Figure 5 illustrates the interlocking characteristics of the components. The importance of a holistic perspective of EE should therefore be evident.

Figure 5

Relationships Among the Components
of the EE Curriculum Domain



NOTE: Numbers refer to Protocol statements.
Letters refer to definitions of the components.
(——) = Primary interaction
(----) = Secondary interaction

PROTOCOL STATEMENTS

1. For the purposes of environmental education (as defined by the Act as amended), any given Issue of National Priority (A) should be studied in terms of the Key Environmental Entities (B).

2. Holistic environmental education addresses the integration of all the Key Environmental Entities (B) with respect to any Issue of National Priority (A).

3. Any given Issue of National Priority (A) must be studied in a Context (D).

4. A Context for Environmental Education (D) consists of at least one Key Entity (B) imbedded in a specific setting of Environmental Interest (C).

5. Changing a Key Entity (B) or a Setting (C) changes the Context (D).

6. Holistic environmental education requires that a given Issue of National Priority (A) be studied in terms of several Contexts (D). Therefore, an Issue of National Priority (A) should be studied holistically by utilizing the minimum number of settings (C) necessary to convey all the Key Entities (B).

7. With the passage of time, changes can occur within Key Entities (B) and/or within Settings (C). Holistic environmental education is primarily concerned with the changes in the patterns of integration of the Key Entities (B) within Settings (C) over time, as they illuminate or clarify an Issue of National Priority (A).

8. The Content Specifications (E) facilitate the study of Issues of National Priority (A) in terms of the changing interactions of Key Entities (B) and Settings (C) over time, by describing how to focus dispersed clusters of concepts and principles into EE contexts.

9. The Curriculum Map (F) identifies the EE subject matter areas and processes associated with Content Specifications (E) and Key Entities (B). It specifies competences that the environmentally aware citizen must acquire in order to understand EE Contexts (D).

10. The Curriculum Map (F) can be used in either of two modes: integrative mode or reductive mode. In the integrative mode, the user begins with subject matter areas and cultural processes and builds up clusters of learning competences and EE principles/concepts that are related to a specific Context (D). In the reductive mode the user begins with a specific context (D) or set of EE principles/concepts and then identifies appropriate subject matter areas, cultural processes, and associated resources. In either mode, the Curriculum Map (F) informs the Context (D) with the information with which to build an instructional/learning arrangement.

From this initial set of protocols, a fairly comprehensive definition of the purposes of holistic energy/environmental education can be constructed. A general definition is:

> Energy/environmental education addresses the systems of humanity and nature as they interact in a values laden context.

A working definition in terms just defined is:

> Holistic energy/environmental education attempts to develop in learners (trainers, teachers, students) a broad and comprehensive understanding of: (a) how the key EE Entities are integrated within specific environmental contexts that involve issues of national priority; and (b) how the pattern of this integration changes over time due to either gradual or abrupt influences.

A Description of the Contextual Map

Contextual Maps present conceptual models of relationships among the content areas that influence and describe an EE situation. The Contextual Map is an intuitive form of graphic presentation, since its structure and the visible connections it displays reflect the process by which it was made. The process of developing the framework for a Contextual Map has both a built-in "memory" and a certain "predictive" quality. These qualities are characteristics of the pattern of presentation structured by the framework.

The framework is not the Contextual Map. The framework is designed from the holistic definition of EE derived from the EE Act. The Contextual Map is constructed in the framework and depicts primary content areas which describe an EE situation and its relational aspects. This graphic manner of presentation and specification of content areas has evolved in response to the complexity and confusion generated under the rubric of environmental education.

The Environmental Education Act (as amended) calls for a holistic, trans-disciplinary approach to energy/environmental issues. The Contextual Map is consequently presented within the following framework, which depicts the most pivotal relationship of energy/environmental education as defined in the EE Act--i.e., HUMAN and NATURAL SYSTEMS INTERACTIONS. Thus, the three primary sectors in the framework are:

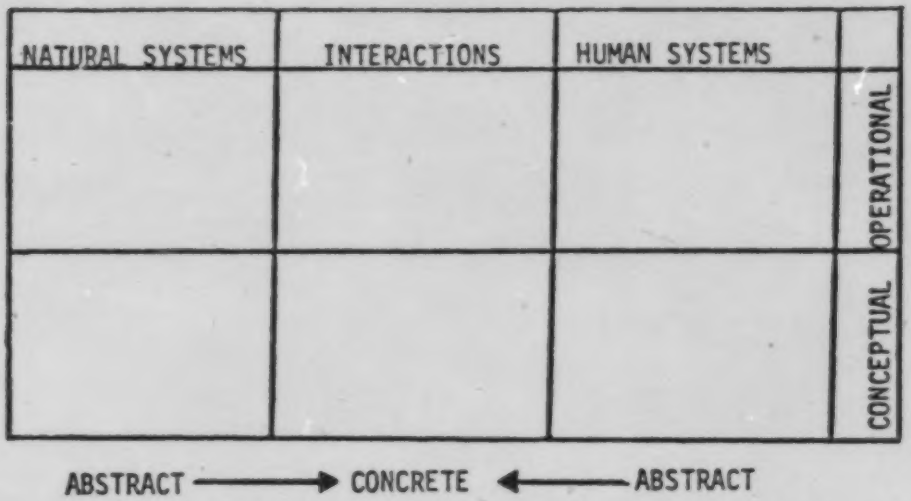
NATURAL SYSTEMS	INTERACTIONS	HUMAN SYSTEMS

The framework is further divided into CONCEPTUAL and OPERATIONAL domains, to enable us to explore the conceptual integrity and operational aspects of alternative sets of relationships among content areas.

NATURAL SYSTEMS	INTERACTIONS	HUMAN SYSTEMS	
			OPERATIONAL
			CONCEPTUAL

The content areas presented within each of the sectors therefore depict Human and Natural Systems Interactions both at a conceptual and at an operational level.

Consequently, we have two reflective dimensions of the Natural/Human Interactions sectors which become increasingly concrete and complex as one moves from both sides into the INTERACTIONS region.



Where one "enters" the contextual map is, to a certain degree, arbitrary, because of the specified relational aspects. Science educators, for example, may wish to begin by addressing Natural Systems elements, while social science or vocational educators may begin with Human Systems elements which focus on jobs.

The constructing of Contextual Maps within this framework is useful in organizing the content areas associated with a specific EE situation, and is good assurance that a holistic and comprehensive treatment of the situation has been designed into the instructional/learning materials and arrangements.

CHAPTER FIVE:

PRODUCT SPECIFICATIONS FOR EE TEACHER TRAINING MATERIALS

As an extension of the model-building effort, the project staff developed an initial image for a set of teacher training materials which represent a transformation of the High School level EE model into useable products. These Product Specifications, then, describe the physical components of a set of teacher training products and their possible content foci.

The Product Specifications contain:

- A brief description of the function of the EETTM components and their general relationship to a teacher training "module" instructional sequence;
- A description of the design specifications for a set of teacher training modules;
- A detailed description of the teacher training module instructional sequence or steps;
- An image of the probable content foci for the teacher training modules.

Function of the EETTM Components

As specified by the Office of Environmental Education RFP, a teacher training model addressing an energy-focused course at the high school level was devised. This model (the EETTM) has provided a useful framework or guideline for the development of product specifications for a set of energy/environmental teacher training "modules." The components of the EETTM, their functions, and their application to the "module" design are as follows:

1. Orientation Guide

   - Introduces the general scope and intent of holistic energy/environmental education.
   - Briefly characterizes the basic components of the EETT model.
   - Characterizes the general behavioral and curriculum requirements for developing the energy/environmentally aware teacher.
   - Provides a rationale for the preparation and concept presentation step in the teacher training module instructional sequence.

2. Sourcebook

   - Elaborates and provides material resources for the EE curriculum.
   - Provides a resource base for the teacher training module instructional sequence--particularly, the preparation and concept presentation, inquiry, and application steps.

3. Content Specifications

   - Describes the EE content components by which the changing integrations between the key entities (specified in the EE Act) over time can be explored and understood.
   - Constitutes a major element in the EE curriculum domain which--when linked appropriately to the other curriculum domain elements via the protocol--provides a basis for developing and exploring case studies for the teacher training module inquiry step.

4. Curriculum Management Specifications

   - Describes a range of instructional/learning arrangements which trainees will consider or utilize in the application step of the module instructional sequence.

5. Implementation Model

- Describes the possible arrangements and settings in which EE teacher training may occur.

A summary of the application of the EETTM components to the design of the teacher training modules is presented in Table 3.

Table 2

Teacher Training Module Instructional Sequence (Steps)

EETTM Components	Preparation & Concept Presentation	Evocation*	Inquiry	Application	Evaluation**
Orientation Guide	X				
Sourcebook	X		X	X	
Content Specifications			X		
Curriculum Management Specifications				X	
Implementation Model***					

* Addresses diagnostic/self-assessment procedures and instruments.

** Built into each of the other instructional sequence steps.

*** Addresses the arrangements in which the modules will be used.

CONCLUSION

What emerged from the model-building work of this project may be viewed as the model of an idealized system of environmental education teacher and community leader professional preparation and training. These generic models can be considered as a basis for developing more specific operational models and products based on an examination of specific constraints. These constraints include: level of present teacher/community leader competence; level and kind of competence desired; accessibility of the trainee target groups; time available for training; instructional and learning resources presently available to mediate the EE content; resources available to support the additional development of instructional and learning resources; and institutional constraints on infusion or delivery of EE. In view of these considerations, various program configurations can be selected, designed, and developed into operational training programs.

Explicit in the training models is the view of environmental education as a holistic, transdisciplinary effort aimed at enabling individuals to confront environmental issues and problems from a perspective of wholeness--to appreciate the relationship between the systems of humanity and nature as they relate to environmental problems or issues. In addition, these models are based on an even broader view of environmental education as a means of providing individuals with an impetus and an experiential base for observing the interrelationship between knowledge and the way that knowledge reflects the real world. With appropriate reinforcement in other curriculum areas and disciplines, the aim is to enable individuals to view holistically most aspects of their lives.

Design Specifications

The purpose of the product specifications is to describe and detail the image of the energy/environmental education teacher training module in terms of:

A. The proposed instructional strategy and its use as an organizing concept for the module.

B. The physical materials that embody the instructional strategy.

C. The functions served by the instructional strategy and physical materials, i.e., how they serve teacher training.

D. The general content and resources to be found in each of the steps of the instructional strategy.

As part of the overall specifications of the EETTM, this section deals with the end-product and its design. Given the previous set of operational specifications, the questions treated are: What does a final product look like? How is it to be used as an instructional module? These questions are answered in the following paragraphs.

Providing a background to the development of product specifications are certain design considerations, materials, and concepts that bound, frame, and give shape to the final product. These include:

- issues, contexts, and content related to energy and environmental education;
- the curriculum map, which provides an overview of (a) subject-matter/topics and (b) cognitive/affective processes relevant to energy-focused environmental education teacher training and to classroom application as a high school course;
- the design of the teacher training implementation system;
- the design of the curriculum management arrangements;
- requirements for resources, training competencies, and learner competencies (for trainers, teachers, and students).

These cited items and their specifications clearly configure the final product in the following ways:

1. The instructional strategy organizes the entire set of materials; the product is guided in its substance, and specified learner (trainer-teacher) tasks and goals by the sequence of the instructional strategy.
2. The energy/environmental issues, contexts, and content influence the specific teacher trainer and trainee outcomes.
3. The curriculum map bounds the kinds and types of resources needed in the product; resources, here, refer largely to printed and audio-visual materials, organized to serve teacher training according to the instructional strategy.
4. The implementation system guides formats and tasks, i.e., self-guided, compentency-based, team-learning teacher workshops.
5. The curriculum management requirements address the types of instructional or learning arrangements teachers need to make in order to transmit energy/environmental content to their students.

In subsequent pages, these requirements are arranged and incorporated into a set of product specifications.*

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*The RFP does not specify, nor detail, its anticipated outcomes either in terms of product format or design. Nor does it specify the precise training outcomes. In approaching this product and module specification, therefore, the following points should be noted: (a) the product or module design must be serviceable for the preparation of teachers to develop an energy-focused environmental education curriculum suitable to their needs and those of their students, and to select, adapt, and use suitable instructional/learning resource materials in their classrooms; and (b) other teacher training functions, e.g., curriculum materials evaluation, student learning evaluation, resource center development, etc., are not addressed directly in this approach.

It is proposed that each module be guided by an instructional strategy that avoids a formal pedagogical style and subject-matter emphasis, stressing instead process mastery in investigating various energy/environmental contexts.

The training strategy involves five steps: (1) preparation and concept presentation; (2) evocation; (3) inquiry; (4) application; and (5) evaluation. Each step entails an orderly sequence of activities, briefly detailed below.

Instructional Sequence

Preparation and concept presentation (orientation, problem introduction, overview) serves as the basis for these instructional and learning aspects:

- background of the module: introduction and overview;
- instructional strategy used in the module;
- outline of tasks ahead;
- educational fundamentals: energy and environmental education--mission, purpose, and training goals;
- overview of teacher training tracks: materials design and development, classroom use, professional development;
- introduction to curriculum map: EE subject-matter and cultural processes;
- introduction to content and context in energy: principles, concepts, themes, issues, and problems;
- overview of team learning organization for ensuing instructional steps.

Each of these elements and those presented in subsequent instructional steps are presented in both the Facilitator's Guide and the modules.

Evocation (assessing one's skills, setting out goals) serves a twofold purpose: (1) it allows trainees to assess what has been given them in concept presentation in terms of their own interests, skills, and needs; and (2) it serves to permit feedback, clarification, and goal-setting against the background of Preparation and Concept Presentation. In this instance, Evocation, broadly speaking, sorts out trainees pursuing the distinct (or combined) training aims of a:

1. Curriculum design and development track
2. Classroom applications track
3. General professional development track

The Evocation step is generally seen as "sorting out" users of the training program; hence, from this point on, the product specifications must distinguish between "user tracks" 1,2, and 3, duly noting the possibility of some overlap in trainee needs and interests. For example, a trainee seeking general professional development might wish to explore the classroom applications area. The following instructional learning elements for this step are proposed:

- Statement of Evocation aims: sorting, selecting, and comparing trainee objectives with enumerated objectives of training modules and learning Tracks 1,2, and 3.
- Diagnostic self-appraisal instruments and interpretation for Tracks 1, 2, and 3. For example:

  Track 1: Curriculum Design and Development

  (a) Unit development and related tasks/goals
  (b) Module development and related tasks/goals
  (c) Course development--also noted in Track 2

  Track 2: Classroom Applications

  (a) Materials and resource selection, allocation, and use
  (b) Infusion units; module adaptation
  (c) Learner focused adaptations

Track 3: General Professional Development

(a) Energy awareness skills/competencies
(b) Energy themes, concepts, principles
(c) Values clarification processes
(d) Resource identification and exploration

- Individual/Group-Based Evocation Exercises:

  Review of problem-solving in energy/environmental contexts
  decision-making in energy/environmental contexts
  values analysis in energy/environmental contexts

  Individual and group readiness assessment:

  --curriculum mapping, instructional unit identification;
  --competency specification and general course design;
  --resource identification;
  --energy/environmental concepts and contexts.

Because the Evocation step is so heavily framed by the Concept Presentation, there is need to keep the materials to a minimum at this step. The facilitator (using the facilitator's manual) plays a key role in guiding trainees to identify interests and skills.

Inquiry (interpretation, comparison, review, in-depth study, preliminary application, treatment of exemplary "resources" and case materials). Inquiry has two purposes: (1) to develop a general energy/environmental knowledge and skill base common to all trainees regardless of their chosen learning tracks; and (2) to achieve mastery of subject matters and processes in demonstration and simulation units. The Inquiry step involves the use of example case study materials, where such materials are analyzed and interpreted against the general concepts presented in Concept Presentation. A well-designed set of Inquiry resources may include:

- concept development exercises emphasizing energy/environmental concepts, principles, and themes that address the key EE entities in selected contexts.

- skill development exercises emphasizing problem-solving and decision-making processes applied to energy/environmental problems and issues;

- values clarification (evaluation) exercises applied to personal decision-making and generating alternative solutions to energy/environmental issues within specific contexts;

- energy/environmental encounter activities, which integrate concept development, skill development, and evaluation in decision-making simulations.

Toward these purposes, the Sourcebook (as proposed) should provide diverse, but highly salient, contextual resources, e.g., reports, news articles, cases, monographs, etc., relevant to the subject-matter and processes of the curriculum map. The Sourcebook is not intended to be, nor can it be, an exhaustive compilation of materials pertaining to energy/environmental education, but is instead a pertinent collection of highly typical, educationally germane items, justified in their inclusion by educational competence objectives and goals. The Sourcebook may be a basis for a compendium, but it is more properly a starting set of vital, essential and training-related documents appropriate to the trainee tasks in both the Inquiry and Application steps. The Sourcebook--unlike an energy/environmental fact book--is primarily an educational document designed for educators; secondly, it must incorporate items of high salience and educational value relative to the topics and processes noted in the curriculum map. As a rule, however, no document enters the Sourcebook that is not keenly related to servicing the basic comprehension and learning track application needs of trainees on well-defined "need to know/need to use" principles.

The Sourcebook should satisfy the Inquiry needs of teacher training participants, not of a general populace. In this regard, the Sourcebook is not a product independent from the modules/instructional-training strategy it services and the target user population. Ideally, the Sourcebook is a basis for educational growth, with such growth being undertaken by the training participant. However, nothing prevents the Sourcebook from including salient regional, national, or community resource items as determined by the needs of

the user.

In terms of materials, then, the Inquiry step includes:

- a guide to the use of the Sourcebook organized according to EE subject-matter, processes, and learning tracks;
- a user case study development plan: prescriptive guide;
- resource examples;
- key concepts drawn from curriculum map framed as resources/documents, charts, tables, schematics, etc;
- an interpretive guide;
- "exemplary" or demonstration exercises or simulations;
- a guide to evaluation of resource utilization and simulation (pre-application) objectives.

Application (practice, experimentation, demonstration) serves the following purposes: (1) permits trainee transfer of previous learning to specific instructional use or "hands-on" doing; (2) allows a systematic, task-by-task approach to the matters of general professional development, curriculum design, and classroom application; and (3) permits the practice of the skills in a prescriptive and evaluative setting. Application is seen here as allowing:

Track 1: Curriculum design and development

The trainee shall undertake the design and preparation of a unit/module, following prescribed design steps, including selection of contexts, content, resources, and educational strategies for a course or infusion approach aimed at:

- course design and preparation
- unit design and development
- module design and development

Track 2: Classroom applications

The trainee shall undertake the design and development of a course of studies, focusing upon extant curriculum and resource materials, including:

- curriculum review and assessment
- infusion applications
- course design and preparation
- materials review and assessment

- tailoring/customizing materials
- classroom introduction and usage
- student learning evaluation

Track 3: General professional development

The trainee shall complete a course of study demonstrating competence in the understanding of:

- energy contexts, concepts and principles development
- resource identification, assessment, and energy resource use
- curriculum design, general unit and module preparation: conceptual and educational factors
- classroom strategies for introducing and/or infusing energy content, grades 10-12
- adapting resource and other energy units for classroom use
- student learning evaluation

The Application step has noted overlapping of practice areas among the three tracks. These areas, such as curriculum review, infusion strategies, resource identification, etc., are generic, but follow a different user plan per track.

The materials and components suggested for the Application step include:

- Resource Guidebook: procedures and task manual for Tracks 1, 2, and 3--composite indexed manual for users
- Case study guide
- Self-evaluation procedures/instruments

The copy for the Application section consists of: (1) training objectives and competencies; (2) task statements sequenced according to the steps noted in the competency; (3) adjunct resources and examples; (4) the user plan; and (5) demonstration materials.

Evaluation. This instructional step may be treated in two ways: (1) enroute evaluation of training with each step; or (2) terminal evaluation. It is suggested that evaluation points be devised at each step--from Concept Presentation to Application--due to the amount of material covered in each step, the complexity of tasks, and the benefit of step-by-step feedback. The proposed evaluation points would consist of group-based discussion, "think points," procedural reviews, and learner progress assessment aids.

MODULE INSTRUCTIONAL SEQUENCE

SUMMARY

Concept Presentation:	Module Background Instructional Strategy Description Tasks Ahead Educational Fundamentals Teacher Training Aims: Tracks 1, 2, and 3 Building Your Own Training Package Introduction to Processes: Decision-Making Value-Development (evaluation) Problem-Solving Introduction to Energy Content, Contexts, and Themes Team Learning Organization Guide Review
Evocation:	Evocation Objectives Track 1, 2, and 3 escriptions Diagnostic/Self-Appraisal Instruments and Interpretations for Tracks Goal-Selection Procedures Review of Concept Presentation; Discussion Guides
Inquiry:	Sourcebook, Resources, and Guide User Plan Demonstration Units/Materials Self-Evaluation Instruments
Inquiry:	Sourcebook, Resources, and Guide User Plan Demonstration Units/Materials Self-Evaluation Instruments
Application:	Resource Guide for Tracks 1, 2, and 3: Protocols and Task Outlines Case Study Guide/Contexts for Energy Self-Evaluation Procedures/Instruments
Evaluation:	Review and Self-Assessment is included in each of the steps above.

Module Descriptions: Possible Content Foci

The energy/environmental content for each of the four teacher training modules will focus on an issue of national priority (INP) which is of concern to our national, state, and local leaders. The energy/environmental issues of national priority that will be investigated in these modules are as follows:

Module 1. Electric Power Generation (Energy Production and Use)

This module will examine and compare the prevalent types of electric power generation systems--coal, oil, and natural gas fired, hydroelectric, nuclear powered--as well as several potential systems--solar, wind, tidal, geothermal; it will examine their individual characteristics and levels of performance, for the purposes of identifying potential net energy gains, hazards, and necessary environmental safeguards.

Module 2. Energy Conservation

This module will examine and compare the many energy conservation measures proposed in the various sectors of American society and will assemble them into "sets" of measures that contribute to a holistic approach to resource allocation and depletion, rather than counterproductive isolated actions at different levels and/or in different sectors of society.

Module 3. Optimal Use of Finite Land Resources

This module will use a carrying capacity methodology to examine finite land resources, population dynamics, and available energies that must be in dynamic equilibrium in order to maintain a stable balance between the needs of urban and agricultural systems in their development and growth and the needs of the natural system to maintain its ecological integrity.

Module 4. Energy-Intensive Urban Growth and the Quality of Life

This module will examine the pattern of U.S. urban growth by considering the influence of economic and energy-related considerations compared to considerations for enhancing the quality of life; it will examine the presently evolving system of urbanization for its potential to reverse the present trend toward decreasing quality of life and higher energy costs for urban society; it will also examine the implications of envisioned future patterns of urbanization on the quality of life and energy costs.

APPENDICES

A. Summary of Review Panel Comments for the Environmental Education Teacher Training Model (EETTM)

B. A Critical Review of the Teacher Training Models: Louis Rubin

C. A Guide to the Evaluation of Environmental/Energy Teacher Training Models

APPENDIX A

SUMMARY OF REVIEW PANEL COMMENTS FOR THE ENVIRONMENTAL EDUCATION TEACHER TRAINING MODEL (EETTM)

This paper is a summary of the comments and responses from a meeting of representatives of intended user groups for the EETTM. The meeting was held at Far West Laboratory on 11 January, 1978.

Bela Banathy	- Principal Investigator of the project and Director of the Instructional Training Systems Program at Far West Laboratory
Ralph Bohn	- Dean of the School of Continuing Education, San Jose State University
Ty Cashman	- Office of Appropriate Technology in Governor Brown's office in Sacramento
Roger Dunn	- Science and Human Values Corporation
Don Langan	- Associate Superintendent of Schools, Kalispell, Montana
Larry Peterson	- Project Coordinator, Far West Laboratory
Esther Railton	- Professor of Education, University of California, Hayward
Louis Rubin	- Professor of Education, University of Illinois, Champagne, Chairperson of the Review Panel
Tony Stigliano	- Program Associate, ITS

The Meeting

The opening hour or so of the meeting was a definition of the model, its salient points and uses. The participants sensed quite early the uniqueness of the EETM as an educational innovation. They were impressed by the idea that the model was not a completed curriculum, but rather the framework for the evolutionary design and implementation process for a curriculum. The

EETTM is a process for creating blueprints; it allows the designer the intellectual and practical space to develop the curriculum content into a concrete program which can be modified and transfored by educational practitioners--teachers, principals, and superintendents. The form of the model is aimed at any intended user: the curriculum content specifications provide the substance for the program, and the operational specifications provide the procedures for program designers to integrate both form and content into the unique setting of the educational process.

The dialogue of the meeting was eminently practical. All of the participants agreed with Rubin* that the "Training Model... is extremely well-conceived, insightful, and comprehensive." The practical uniqueness of the design lay in the melding of curriculum design with teacher training (this was Rubin's insight). Moreover, that the design was to be finally realized as part of an interplay between model, designer, and teacher was considered by the participants to be crucial to whatever success the EETTM would have.

The conversation moved from one topic area to another. The participants

- inquired into the nature of the model for the design of curriculum models (a "meta-model," loosely speaking);
- determined the characteristics of EETTM as a meta-curriculum design model;
- identified the theoretical problems associated with design and implementation of a systemically based, and systemically designed and implemented curricula (a "meta-design origin curriculum" neologism from Don Lagan;
- identified the human and economic resources necessary for implementation of EETT programs;
- inquired into the proposed designer role of the teacher.

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*Rubin's detailed comments appear in Appendix B.

The conversation broached the preceding topics at various points in different ways. . The dialogue itself might be summarized as follows.

Programs that presently exist appear to fall into two categories: (1) the program allows itself to become "diluted" into a wholly unrecognizable thing in the classroom; this is the result of "fitting one system into an imcompatible system" (Dunn); or, (2) the program will not be diluted, and therefore, is abandoned. This dilemma and how to avoid its horns held the interest on and off of the meeting's participants throughout the day. It was not universally believed, however, that this dilemma is a necessary one. Railton and Banathy both offered this view independently of each other. For Railton, it was a matter of careful evaluation and monitoring, which would emerge as part of the design process. Moreover, the dilemma might be avoided if classroom teachers were involved at all stages of the design, development, and implementation of the program emerging from EETTM. For Banathy, the problem was a matter of creating those linkages that would guarantee the coherency of the model for a variety of target groups and educational strategies.

The question of the integrity of the model was associated with other questions: the problem of evaluation and the problem of entry points into the classroom.

The evaluation question provoked many comments: evaluation would involve not only judging long-term effects, but also providing short-term assessments for people who are interested (professionally or politically) in the short-term effects of a program. The question of classroom entry involved viewing the classroom as a part of a systemic whole. It was clear that: (1) there must be a holistic EE program available for all the grades, and (2) instructional leadership teams must be created for curriculum management (Banathy). The team would include administrators, building principals, teachers, etc.

Bohn said that the model is not a simple, flashy multi-media commodity, but is an invitation to the "struggle of learning and teaching." Teachers are expected to instruct children how to think, to solve problems, and to choose careers and lifestyles in accordance with rational models of these processes. Moreover, the teacher is being asked to design programs that are value-laden. All of this is a far cry from the model of information exchange now existing in the schools. The students would perceive a program derived from EETM as alien because their thinking is rigidly set in a mold of 'information in/information out.'

These problems are compounded by the dread teachers have of interdisciplinary team efforts. High school teachers especially are territory-oriented (Langan). This conservative attitude extends to the general problem of introducing innovations, especially innovations concerning values.

Suggestions were made to overcome these problems:

- The whole school must be affected by the new system.
- Rubin suggested that "staff development activities serve as a vehicle for introducing program content."
- More advanced teachers and students in a model program could be the source of spreading ideas and convincing some that programs derived from EETTM are beneficial.
- Team teaching was clearly seen as being a failure by Bohn and Langan; but it was pointed out that the team approach did not have a team program even approaching the depth and comprehensiveness of the EETTM. This model has the potential, it was agreed, for creating genuine interdisciplinary education.
- Bohn argued that implementation was critical. Implementation, he said, is dependent on teachers; teachers who support the program may help integrate a somewhat diluted ("it can't be helped") program.

It was clear that the exact functional context would determine the success of whatever program emerges in the design-development-implementation process (such contexts were defined in the Experience Based Career

Education Project). Moreover, the rigorous language of the model, its adaptive flexibility, and the emergent commitment of teachers and administrators would preserve the form and content of EETTM through its evolution to the classroom level.

The problem of values came up repeatedly but it was clear that values had to be faced. Information might be "value free"; but the decisions involving the environment and human relations to it necessarily involve values--not a consensus of values, perhaps, but if thinking and life-molding decisions (for both individual and society) are to be made, value-laden questions and methodologies must be created to confront and transform reality.

Railton admired the objectivity and "lack of bias" in the various processes and functions of the model. She further urged that people from business, industry, and labor be encouraged to share their technical expertise (and points of view) for the content areas. This process would preserve the unbiased nature of the model. In support of this point, though not made in direct response to it, Peterson pointed out the cautious, controlled, and carefully evaluated process we went through to produce the model. Rubin's comment was that every area of the model offers "high testimony to the fact that the project staff approached the tasks with unusual thoroughness and knowledgeability."

Furthermore, Rubin pointed out that the model and plans for its implementation* overcome traditional fragmentation in "most teacher training efforts." This, he believed, constitutes a step forward in the areas of curriculum design and teacher training.

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*Such as the Operational and Product Specifications.

In all, the meeting concluded that the EETTM was an extraordinary piece of work both theoretically and practically.

APPENDIX B

A CRITICAL REVIEW OF THE
TEACHER TRAINING MODEL
FOR HIGH SCHOOL ENERGY-ENVIRONMENTAL EDUCATION

My general reaction to the Training Model is that it is extremely well-conceived, insightful, and comprehensive. In contrast to most endeavors of this sort, the report reflects a considerable sophistication regarding curriculum design, the inservice education of teachers, and the special problems embodied in environmental education.

In particular, the systemic approach to the program is most laudable. The typical instructional programs tend to be overly simplistic, to ignore the internal relationships between knowledge, attitudes and skills, and to treat curriculum design and teacher education in isolation from one another. As a consequence, the project should make a substantial contribution to the field.

The nature of environmental education is such that a "holistic" approach is especially desirable. Aside from the fact that concepts and principles from a diverse range of disciplines must be incorporated in the instructional design, the opportunity for perpetuating the objectives of the program exist in virtually every area of conventional courses of study.

The major theoretical postulations underlying the approach described are most apt. For example, the emphasis on teaching as a decision-making process is congruent with current trends in staff development; the stress upon an anticipatory curriculum is consonant with current learning theory; and the focus upon the learner as the critical instructional target jibes with the prevailing trends toward flexible individualization.

For these reasons, it is particularly important to emphasize a global approach, not just in the substantive elements of the instruction, but also in multiple curricular applications. Put another way, environmental education should not occur in a pre-determined subject area, or in a mandatory and described period of instruction; rather, it should permeate the entire instructional sequence and its objectives should be reflected in a great many different aspects of school.

It is important in this regard, I think, to link the precepts of participatory democracy to the instructional goals. Students, after all, do not control agricultural practices or industrial policies. A well-informed citizenry, however, can exert profound influence on those who do govern these things - through the exercise of public concern.

Upon occasion, passages in the document reflect a particular bias regarding appropriate conservation tactics. On page 31 in Section One, as an illustration, it is argued that our current environmental plight is attributable to "goal achievement" rather than "proper process practices." Some presumably knowledgeable experts, I suspect, might quibble with this point of view. It might be advantageous, consequently, to emphasize that the primary thrust of the instruction engender student awareness and commitment rather than to propagandize for particular solutions. Although

the issue is a minor one, human predilections are such that a very valuable and constructive program is sometimes demolished or rejected because of some obscure and secondary provision.

Similarly, since science and social science teachers often vary in their attitudes toward what constitutes intelligent environmental protection, it will be necessary - in any direct application of the teacher education component - to strive for reasonable consensus on a general body of values and beliefs regarding sensible energy controls.

The Content Sourcebook, described on pages 39-40, Section One, constitutes an extremely valuable aspect of the Model. Properly conveyed in the teacher training activities, it should go a long way in facilitating the implementation of the program. Here again, however, at least some provisions for teacher individualization are essential. In short, teachers, in both science and social scierce, are likely to differ in their sophistication, dedication, work situation, and pedagogical style. As a result, the astute emphasis on teacher autonomy, so clearly manifest in the Model, should be brought to include at least some attention to alternative devices for individual teacher adaptation.

The excellent analysis of potential users, in Table One, is also relevant in this connection. Since all users are not likely to be interested in either the same applications, or the same methods of applications, toil should be taken to repeatedly point out that different clients can implement the Model in

whatever way is most appropriate to their circumstance.

More than anything else, I suspect, the critical aspect of the program lies in cultivating informed students who are both knowledgeable and highly committed to rational energy production and consumption. Hence, point 5, on page 49, in Section One, represents the heart of the program. To underscore this, the significance of healthy consumer attitudes might be generally reinforced throughout the program description. And, in somewhat the same vein, the benefits of total curricular involvement might also be accented. While it makes abundant sense to organize the program primarily for science and social science teachers, it should be made apparent that English teachers, history teachers, physical education teachers, health teachers, too, can contribute to the goals.

The curriculum model, page 59, outlining the three dominant teacher competence domains is extremely perceptive. They avoid the customary fragmentation in most teacher-training efforts, as well as reflect a sensitive awareness of the interplay which must exist among the three. While all are imperative, it is likely that the greatest challenge will lie in the development of personal incentive among teachers. Thus, it is of great importance that the activities relating to "managing instructional-learning arrangements" be organized in such fashion that environment education complement other curricular aims without mitigating against their achievement. In short, teachers should understand that the development of environmental awareness and concern need not interfere

with the learning of grammar, mathematics, or anything else. If the traditional "either-or" mystique is allowed to take hold, the cause could easily be lost. Particularly in a time of "back to basics," and a special preoccupation with declining test scores, the long-range importance of environmental education must be stressed. In a sense, this is a political rather than an organizational problem. It would be helpful, for example, if the various states could be persuaded to make environmental awareness one of their criteria for minimal-competence achievement.

As in many other sections of the Model, the eight knowledge areas, set forth on pages 60-61, are extremely germane. They offer high testimony to the fact that the project staff approached the task with unusual thoroughness and knowledgeability. Parenthetically, however, I might note that the last paragraph on page 61, relating to variable degrees of competence, might be re-stated. It might be better, to wit, to substitute involvement for competence in the first sentence of the concluding paragraph on the page.

It might be also observed that the overview of instructional-learning arrangements, pages 62-63, represent an excellent analysis of the major elements in teacher re-training. This same sophistication is reflected in later sections of the program dealing with teacher training and staff development. It might be possible, in this context, to use teacher training as a vehicle for introducing environmental education. That is, instead of concentrating upon program introduction, followed by teacher reorientation, some benefit might be derived from reversing matters so that the staff development activities serve as a vehicle for introducing the program content. While there may be impediments to such a maneuver, the procedure would permit the project team to take advantage of the high current interest in Teacher Centers, on-the-job teacher growth, and other contemporary movements relating to the continuing

professional growth of educators.

Special praise also must be made regarding the organizing values, in the section on curriculum management specifications. The concepts on which the rationale is based dovetail almost exactly with current theories on teaching and learning. The distinction between short-term and long-term objectives, for example, suggests that the project personnel deserve very high marks for doing their homework with exceptional dedication.

In Part Two of the same section, components of curriculum management, an earlier warning regarding the importance of an eclectic approach to environmental policies is again germane. Much would be gained if controversial topics and areas could be avoided, so that dominant concentration was focused upon those general values which are universally accepted.

In concluding, several general suggestions might be made:

1. What could be done to determine the unanticipated problems which may be encountered in implementing the program?
2. What steps could be taken to estimate the probable degree of receptivity on the part of the teaching profession?
3. Are certain mechanisms likely to be much more successful than others in enhancing the incorporation of the program in present curricular structures?
4. Can other aspects of social consciousness be dealt with in conjunction with environmental education?
5. Can the in-service component, in itself an excellent conception, be used in conjunction with other programs?

All in all, the project staff is to be congratulated on a first-rate piece of work.

Lewis Rubin

APPENDIX C

A GUIDE TO THE
EVALUATION OF ENVIRONMENTAL/ENERGY
TEACHER TRAINING MODELS

The evaluation schemes introduced here aim to provide the means to facilitate your review of the environmental/energy education teacher training model and its components.

The following materials are enclosed for your review: 1) Orientation, including the rationale and definition of environmental education teacher training, the behavior model, the target group characterization, and the curriculum model; 2) Content Specifications; 3) Curriculum Management Specifications; and 4) Implementation Model. Keep in mind while reviewing these models and manuals that these are not actual instructional materials, but are specifications of scope and content from which teacher training materials could be derived.

We are interested in any observation you would care to make about the enclosed materials, although we would most like you to address three types of questions: 1) conceptual adequacy and accuracy, 2) inter-component consistency, and 3) likely usefulness for deriving teacher training materials. For each of the manuals, we have provided you with some specific questions, though we welcome additional comments. Suggestions for improvement would be particularly useful to us, since we do intend to make revisions in the models and manuals based on your comments and those of teacher trainees participating in the pilot test. Thank you for your time and effort.

PROPOSED CRITERIA FOR REVIEWING THE ENVIRONMENTAL EDUCATION TEACHER TRAINING MODELS* DESIGNED BY THE FAR WEST LABORATORY

Adequacy

- in meeting specifications against which the models were designed
- in terms of the state of art in designing teacher training models

Relevance

- for the intended users of the model (primary users are R&D personnel)
- for the teacher target groups as specified

Necessity - Sufficiency

- components of the model are necessary and
- sufficient to meet stated requirements

Internal Consistency

- various components and conceptual presentations are internally consistent

Feasibility of Implementation

- technical
- economic

Utility

- operational/product specifications are available so that the model can be transformed and developed into a teacher training program

Clarity

- of the conceptual presentation
- of style and language used

Elegance

(State for richness and simplicity of design.)

*Model as used here means an abstract representation of a system to be developed.

I. Conceptual Adequacy and Accuracy

A. The Energy/Environmental Education Teacher Training Model (EETTM)

1) As illustrated in Figure 1 of Orientation, the Content Specifications and the Curriculum Management Specifications have been derived from a curriculum model, a behavioral model, a target group characterization, and a rationale and definition of EE. Are there components that you think need to be added to or deleted from the EETTM (as presented in Figure 1)? If so, what?

B. Behavioral Model

1) How well do you think the general knowledge, skill, and attitude requirements described in the behavioral model meet the needs specified in the Environmental Education Acts of 1970 and 1974?

	Very Well	Adequately	Not Very Well	Very Poorly
a) Knowledge requirements				
b) Skill requirements				
c) Attitude requirements				

2) What EE needs specified in the EE Acts do you think are not covered by these general requirements in the behavioral model?

3) How well do you think the general knowledge, skill, and attitude requirements specified in the behavioral model address what you perceive to be the important EE needs?

	Very Well	Adequately	Not Very Well	Very Poorly
a) Knowledge requirements				
b) Skill requirements				
c) Attitude requirements				

4) What EE needs that you perceive are not covered by these general requirements?

C. Curriculum Model and Content Specifications

1) Comment on the adequacy and appropriateness of the scope of the EE content specified in the Content Specifications.

2) Please make any suggestions you might have for modifications or elaborations of content specifications to improve their adequacy or appropriateness.

D. Curriculum Management Specifications

1) Do you think the "purpose, plan, implement, evaluate" guidelines presented in the Curriculum Management Specifications are appropriate and realistic for teachers?

Very Somewhat Not Very Not at All

2) What aspects of that content are not consistent with what you think is effective instructional strategy and management?

3) What other aspects of curriculum management do you think should be included in these specifications?

E. Implementation Model

1) To what extent do you think the Implementation Model specifications adequately characterize what teacher trainers need to do?

Very Much Somewhat Not Much Not at All

2) What additions, deletions, or modifications should be made to the Implementation Model so as to characterize more adequately teacher trainer activities?

II. Inter-Component Consistency

A. Consistency of Models and Specifications with underlying Rationale and Definition

1) Listed below are several characteristics that we felt environmental education projects should have in order to be in accord with the EE Act of 1970. To what extent do you think the desired outcomes specified in the behavioral model and Content Specifications are consistent with these characteristics:

	Great Extent	Some Extent	Only Small Extent
a) appropriate multi-disciplinary or interdisciplinary content and approaches are utilized in a highly integrative manner			
b) participants are encouraged and assisted in identifying alternative solutions to environmental problems			
c) the ability to understand interrelationships within and among various environmental entities, subsystems, and systems is emphasized			
d) long-term as well as immediate environmental improvements are of concern			

2) Please indicate any suggestions you have for modifications of the desired outcomes in the behavioral model or the Content Specifications so that they are more in accord with the characteristics derived from the EE Act.

3) To what extent do you think the curriculum model or the Content Specifications will accommodate a synthesis and integration of pertinent subject matter across and between a variety of traditional disciplines?

4. Please indicate any suggestions you have for modifying the Content Specifications so as to provide for greater potential synthesis and integration of subject matter across and between traditional disciplines.

5) Based on your reading of the behavioral model, the curriculum model, the Content Specifications, the Curriculum Management Specifications, and the Implementation Guide, indicate the extent to which you think the EETTM and its components demonstrate concern (consideration) for each of the following characteristics:

	Great Extent	Some Extent	Small Extent
a) consideration of initial trainee competence and previous teaching experience			
b) emphasis of competences that will enable the individual to consider alternative instructional/learning events and to predict relevant learner outcomes			
c) provision of experiences in which the teacher can plan, design, implement, and see the effects of selected instructional/learning events			
d) provision for assessment of instructional and learning outcomes and adjustment in performance based on such assessment			
e) emphasis on a competence-based approach			
f) provision for planned application of what is learned			
g) adaption of instruction to individual needs, interests, and characteristics			

6) Please indicate any suggestions you have for modification of any of the components of the EETTM that would facilitate development of a program more in accord with the above characteristics.

B. Consistency of Content Specifications and Curriculum Management Specifications with Behavioral Model

1) For each of the following general EE knowledge requirements (specified as desirable outcomes in the behavioral model), indicate how appropriate and adequate you think the knowledge components in the Content Specifications are (1 = quite adequate and appropriate, 2 = could use some revision or expansion of content, 3 = need substantial revision or expansion of content):

a) understanding of the interrelationships between and among energy entities, phenomena, systems, and subsystems_____

b) understanding of the systems structure, requirements (needs), and impacts (need satisfaction, problems, conflicts) of these interrelationships _____

c) understanding of the reciprocal effects of human activity in terms of energy production and use, energy problems, and energy problem-solving_____

d) understanding of the contexts (natural and human-designed) within which energy, energy problems, and alternative energy problem solutions must be viewed for comprehensive, responsible, and future-oriented decision-making _____

e) understanding of the methods of inquiry and decision-making appropriate to comprehending, analyzing, and solving energy issues/problems _____

2) For any of the knowledge requirements you thought needed revision or expansion, indicate any suggestions you have for such revisions or expansions.

3) For each of the general instructional management skill requirements (specified in the behavioral model as desirable outcomes), indicate how appropriate and adequate you think the content specifications in the Curriculum Management Specifications are (1 = quite adequate and appropriate, 2 = need some revision, 3 = need substantial revision):

   a) ability to plan an energy education curriculum by setting energy awareness learning objectives that are consistent with students' pre-assessed abilities and needs _____

   b) ability to plan an energy curriculum by selecting appropriate energy content and suitable instructional/learning arrangements to convey the content to students _____

   c) ability to implement instructional/learning arrangements that convey the energy content to students _____

   d) ability to evaluate the effectiveness of the instructional/learning arrangements in facilitating students' attainment of energy awareness learning objectives, and to make suitable adjustments in these arrangements where necessary _____

4) For any of the skill requirements you thought needed revision or expansion, indicate any suggestions you have for such revisions or expansions.

5) For each of the following general attitude requirements (specified in the behavioral model as desirable outcomes), indicate how appropriate and adequate you think the content specifications in the Content Specifications are (1 = quite adequate and appropriate-will likely foster these attitudes, 2 = need some revision, 3 = need substantial revision):

a) a preference for using cognitive (analytical) and affective (valuing) tools coupled with the knowledge bases of various disciplines in a highly integrative manner in exploring energy problems and issues with students_____

b) a tendency to seek out and emphasize human being-environment interrelationships which lead to "productive harmony" regarding energy production and use_____

c) a tendency to search for and discuss energy policies that reflect long-range, as well as short-range, concern for the impact of energy programs and activities on environmental quality_____

d) a willingness to consider physical, psycho-social, economic, cultural, and other factors in addressing energy problems _____

e) a tendency to encourage individual responsibility in making life-style and easier choice decisions that are consistent with holistic, long-range strategies for energy production and use _____

f) a tendency to encourage students to commit themselves to coping holistically, systemically, and scientifically with energy questions and issues _____

6) Please indicate any suggestions you have for revisions or expansions in the Content Specifications that might better foster these attitudes.

C. Consistency of content and rationale in Content Specifications

1) For each of the 8 sections of the curriculum content system, the Content Specifications presents knowledge components and the rationale for these components. The rationales are very much like teaching goals or objectives. To what extent do you think the rationales are reflected in the knowledge components (i.e., to what extent would instructional materials based on the knowledge components be likely to achieve the teaching goals)?

likely to achieve:	all goals	most goals	some goals	few goals
PART A				
Section 1				
Section 2				
Section 3				
Section 4				
PART B				
Section 1				
Section 2				
Section 3				
Section 4				

2) Please list any rationales for which you think the knowledge components are inadequate. We would appreciate any suggestions you have for more adequate knowledge components for these rationales.

III. Usefulness of Model Documents in Developing Teacher-Training Materials and/or Programs

A. How useful do you think each of the following will be as guides to those trying to develop teacher training materials and/or programs to meet the EE needs specified in the EE Acts?

	Very Useful	Somewhat Useful	Not Very Useful	Not at All Useful
1) Orientation Specifications				
2) Content Specifications				
3) Curriculum Management Specifications				
4) Implementation Model				

B. What do you think were the main shortcomings of the model documents you thought would not be useful?

C. How could these model documents be made more useful to potential EE curriculum developers?